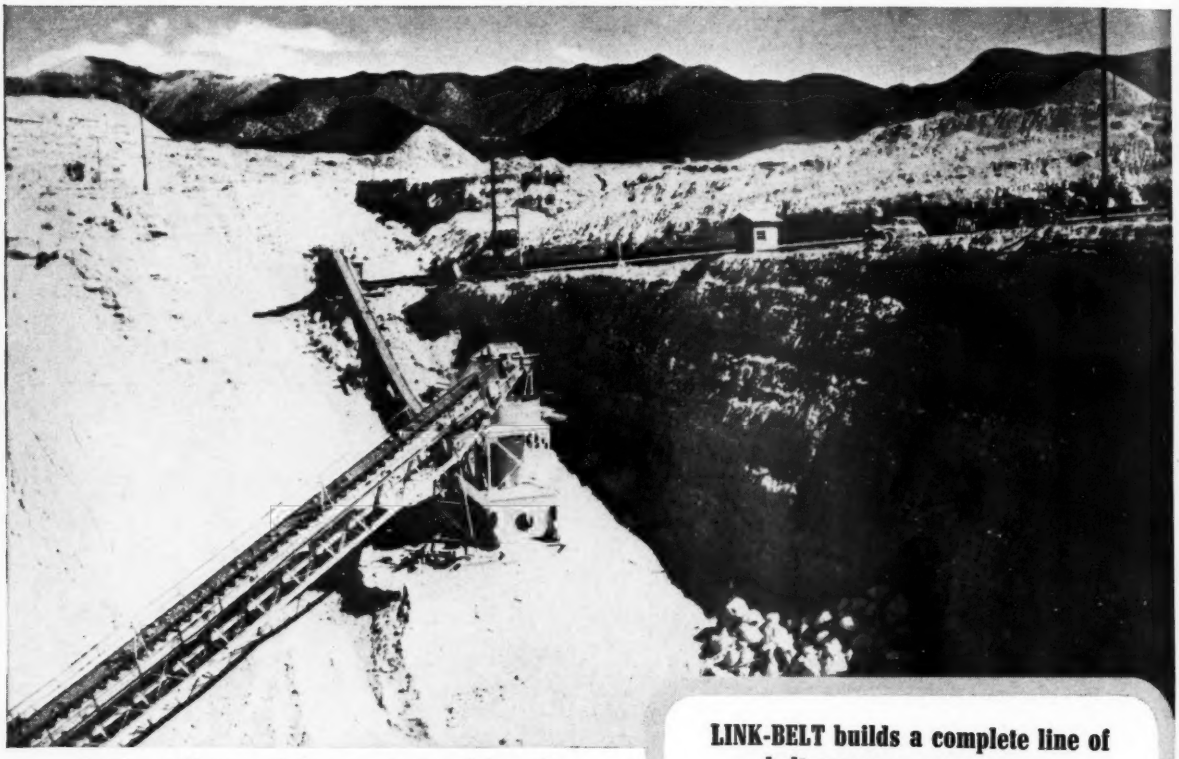
Mining CONGRESS JOURNAL

SEPTEMBER 1953

TOTAL ENGINEERING



Porphyry gold ore, crushed enroute, is elevated from pit floor to storage area by series of Link-Belt belt conveyors.

It's your assurance of top efficiency with LINK-BELT belt conveyors

HERE'S how "total engineering" works for you when you use Link-Belt Belt Conveyors. First, Link-Belt conveyor engineers analyze your needs—then recommend the *right* components. In addition, Link-Belt can supply all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers. And Link-Belt will build your supporting structures and enclosures . . . install the job completely, if desired. Call the Link-Belt office near you for any engineering assistance you need.

LINK-BELT

BELT CONVEYOR EQUIPMENT 13,260-D

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales offices in Principal Cities.

LINK-BELT builds a complete line of belt conveyor components

ALL TYPES OF ROLLER BEARING IDLERS

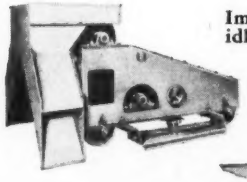
Return idler

20° troughed idler

Belt-training idler

Rubber tread return idler

Impact-cushioning idler



BELT AND MOTOR PROPELLED TRIPPERS

COMPLETE TERMINAL MACHINERY

YOU'LL FIND THE DIFFERENCE INSIDE THE

Exide-Ironclad

Inside . . . where it counts most . . . EXIDE-IRONCLAD is entirely different than any other battery. It's made that way by EXIDE'S exclusive IRONCLAD slotted-tube construction . . . a principle that provides direct operating-hour savings for you.

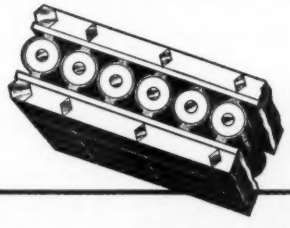
OF ALL BATTERIES, ONLY EXIDE-IRONCLADS HAVE POWER TUBE POSITIVES

The positive plate is different . . . unique . . . exclusive. It is the most effective retainer of active material yet demonstrated in heavy duty service. Slotted tubes contain the active material. So fine are the slots that, while permitting easy access of electrolyte, they retard the active material from washing out, hold it during repeated cycles of charge-discharge, and the vibration of rough use.

Today's battery-powered equipment is being used harder than ever before. Unless the batteries have internal shock protection they tend to deteriorate under hard usage—both electrical and mechanical. Only Exide-Ironclad has the plus-protection of the tubular positive that can withstand today's more exacting and rigorous heavy-duty battery services.

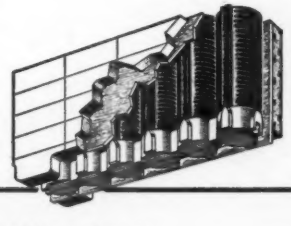
Your EXIDE sales engineer will give you the factual inside story. See for yourself why *only* an EXIDE-IRONCLAD gives maximum day-after-day service under the most difficult operating conditions . . . *with a minimum of maintenance expense.*

Cross section shows relation of positive plate to separators and negative plate. Note the much greater exposure of active material to electrolyte as compared with that of the usual flat positive plate. This greater exposure makes possible the high power ability and uniform-voltage characteristics of the Exide-Ironclad. The negative plates have been made extra heavy to balance the increased capacity of the power tube positives.



Running through center of each tube is an alloy core which is cast with the heavy top cross bar. These form the sturdy, non-buckling grid. Both core and top bar are made of Exide's new corrosion-resistant Silvium, an alloy of silver, lead and other components, which adds greatly to plate's long life.

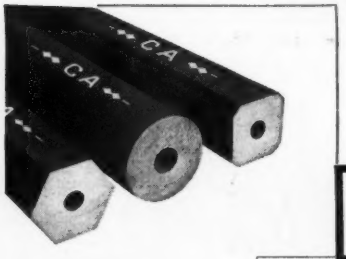
New polyethylene insulating tube sealer of acid-proof, non-corroding plastic fits snugly into bottom of slotted tubes and further reduces loss of active material. Thus more active material remains available, and the high battery capacity is maintained for a longer working life.



1888 . . . DEPENDABLE BATTERIES FOR 65 YEARS . . . 1953

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 2 • *Exide Batteries of Canada, Limited, Toronto*

"EXIDE-IRONCLAD" and "SILVIUM" *Reg. T.M. U.S. Pat. Off.*



they're using CRUCIBLE HOLLOW DRILL RODS on the Delaware Aqueduct

CRUCIBLE HOLLOW DRILL RODS are helping construction crews to complete the vast network of dams and tunnels being built to increase New York City's water supply. When finished, water from the Pepacton, Neversink and Rondout Reservoirs, which will be impounded by a trio of earth-fill dams, will be conducted to New York through the 85-mile-long Delaware Aqueduct.

In rock drilling operations for the dams, effluent chambers and connecting tunnels, Crucible Hollow Drill Rods have proved their ability to outperform other types . . . to withstand the severest punishment with minimum breakage and bit loss.

That's because Crucible Hollow Drill Rods are made to tool steel specifications by the nation's leading producer of tool and other special purpose steels. These high quality drill rods have greater fatigue strength — you can count on lower cost per foot of hole in hard rock drilling. Next time you have a drilling job, be sure you order Crucible Hollow Drill Rods.

CRUCIBLE first name in special purpose steels

53 years of *Fine* steelmaking

HOLLOW DRILL ROD

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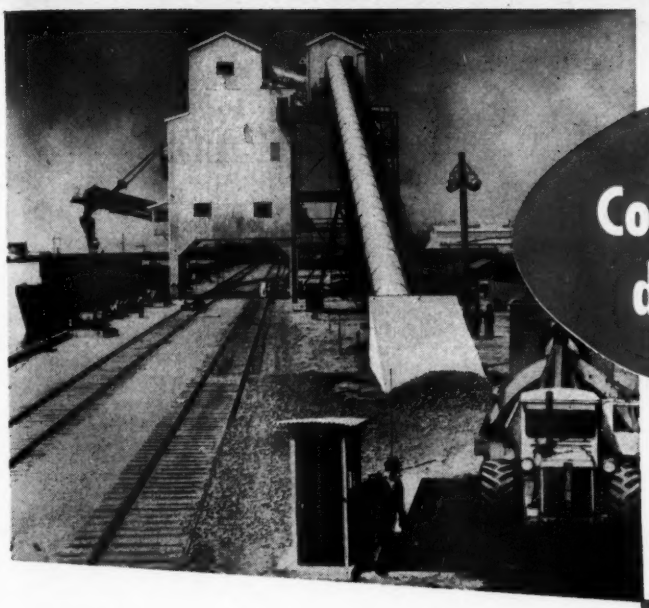
REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MAX-EL MACHINERY • SPECIAL PURPOSE STEELS



New Coal Handling System designed for today

...and tomorrow

by HEYL & PATTERSON

WHEN formulating plans for their new Northeast Coal Storage Yard, engineers of the Philadelphia Electric Company planned for the future when the new yard will probably require unloading equipment to supplement the facilities at nearby locations.

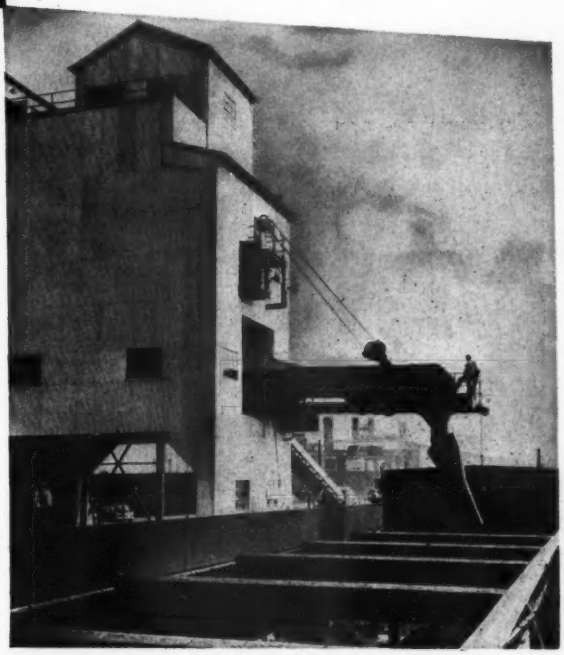
Heyl & Patterson designed, fabricated and erected this modern coal handling system that handles today's needs with precision and efficiency . . . and is also designed to fit in with plans for future requirements.

This coal handling system illustrates the constant aim of Heyl & Patterson . . . to work hand-in-hand with the customer to provide the very best Heavy Bulk Materials Handling Equipment to answer the customer's particular needs.

When *your* problem centers around the handling and transportation of coal, ore, limestone or any Heavy Bulk Material . . . take advantage of the complete engineering, fabricating and erecting facilities of Heyl & Patterson. Think first of Heyl & Patterson . . . with over 65 years experience in the specialized field of Heavy Bulk Materials Handling.

TOP PHOTO . . . Coal being reclaimed at Philadelphia Electric Company's Northeast Coal Storage Yard is dumped into a sunken hopper and carried by means of a belt conveyor to the top of the loading tower where it is deposited into a 250-ton-capacity storage bin. The coal is then fed from the storage bin either to the barge loader or into railroad cars or rubber-tired mobile equipment.

A series of lights in the operator's station indicates the amount of coal in the hopper at all times. The entire system is automatically "tripped-out" by the "full" indicator.



SHOWN HERE . . . Barge loading at 800 tons per hour is accomplished by a 37′ loading boom which can be raised or lowered to meet all barge-loading conditions. Barges are trimmed by the swinging chute at the discharge end of the loading boom.

All conveyors and gates of the conveying system are interlocked to prevent "pile-ups" in case of failure in any part of the system.

- Coal Handling Equipment
- Boat Loaders & Unloaders
- Coal Storage Bridges
- Coal Preparation Plants
- Cyclone Thickeners
- Reineveld Centrifugal Dryers
- Thorsten Coal Samplers
- Bradford Breakers
- Coal Crushers
- Rotary Mine Car Dumpers

Heyl & Patterson, Inc.

"SINCE 1887"

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No matter what other method you are now using . . .

AIRDOX

NON-EXPLOSIVE MINING METHOD

can cut your cost of face preparation

This is admittedly a broad statement.
It is supported by the fact that AIRDOX has proven *in mine after mine* that it produces coal at lower cost per ton than any other mining method.

1. **The actual cost of dislodging is less with AIRDOX in practically every case.**
2. **The way AIRDOX dislodges coal makes it easier and cheaper to load.**
3. **AIRDOX produces less fines, which reduces cleaning costs.**

More, AIRDOX is safer to use and it protects roof structure, another important factor in reducing operating costs.

Make us prove this with facts and figures . . . Write for a free survey.

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A NEW ONE-MAN DRILLING MACHINE

with integral air-leg feed and automatic air-water back-head

Perfected by

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No. 380
AUTOMATIC DRILLING MACHINE
With Aluminum Cylinder and Piston

TOTAL WEIGHT 80 LBS.
36" OR 48"
FEED

INTEGRAL AIR FEED eliminates improvised clamping, extra air hose; consolidates drilling and feed controls on back-head of machine. Easier to set up, easier to adjust, easier to run.

AUTOMATIC AIR-WATER BACK-HEAD controls water and air from single throttle. Optional plugs for dry collaring, or dry drilling. Provides complete versatility for all drilling conditions.

Check these Thor features!

1. CONTROLS conveniently grouped on back-head for safe, convenient operation.
2. EXCLUSIVE SIX POSITION THROTTLE VALVE . . . from complete shut-off of air and water, to full air and water in logical steps for full control and convenience.
3. AIR LEG CONTROL KNOB conveniently located for natural, right-hand operation. Exclusive instantaneous push-button release for safety.
4. SINGLE AIR HOSE supplies air to drill and to leg (through drill and mounting swivel).
5. PERFECT BALANCE of drill and leg eliminates superfluous adjustments.
6. HINGE JOINT between drill and leg has tension adjustment. Exclusive extra-large friction disc holds selected tension indefinitely.
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8. FOR USE AS SINKER, air leg can be easily detached by loosening one nut.
9. WATER AND AIR HOSE swing freely at left, out of operator's way. Exclusive fastening method eliminates possibility of connections loosening or leaking.
10. EXCLUSIVE 2¼" DIAMETER FEED LEG provides added pressure to keep bit on face for longer life, especially when tungsten carbide bits are used.
11. EXCLUSIVE NEW HOLDING HANDLE provides greater safety. Conventional spade handle optional.
12. EXCLUSIVE SCRAPER RING on piston rod prevents solids from entering cylinder. "O" ring seal repels liquids.

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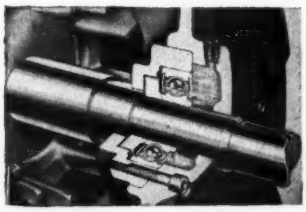

. . . AND THE BEST PRE-LUBRICATED BEARING DESIGN
The Reliance pre-lubricated bearing provides *four times more operating hours without re-lubrication* than any other bearing used in motors today. And—whatever your lubrication schedule—*you just can't grease'em wrong!* To get the complete "inside story" on motor bearings, write today for Bulletin B-2201. It contains hard facts on the advantages of the Reliance pre-lubricated bearing design, with cutaway view, cross-section diagram, comparison chart, and statements by bearing manufacturers. B-1458G

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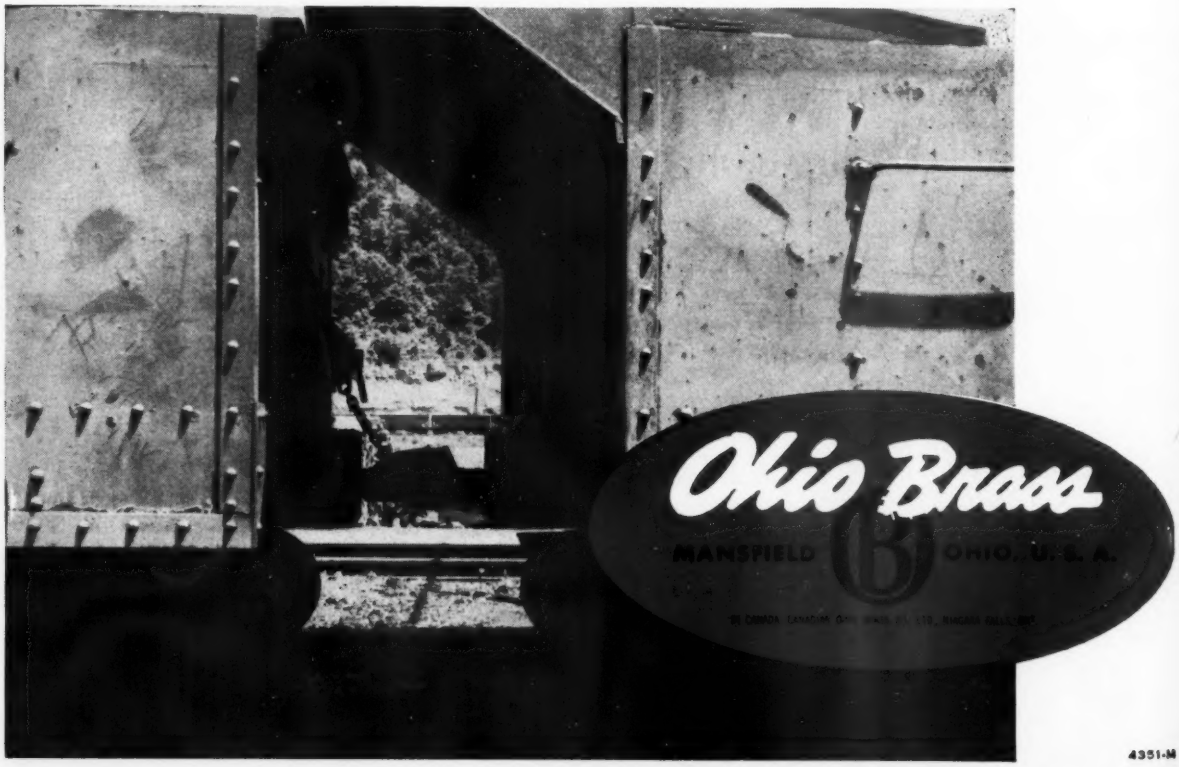
Restrained slack between mine cars permits cars equipped with O-B Automatic Couplers to stand off the worst sort of mine haulage punishment. This slack comes from rubber pads which compress — or give — to absorb blows, but which also expand again to keep all coupler parts bearing firmly on one another. No part of an O-B Coupler can flop about loosely—engaged or unengaged.

These rubber pads form the draft gear of O-B Automatic Couplers. They give when necessary; they always regain their original shape; they hold unengaged couplers ready to join with mating heads.

Restrained slack protects and prolongs car life when O-B Automatic Mine Car Couplers are in use. That's one pretty good reason for choosing O-B for your new or remodeled cars!

O-B Automatic Mine Car Couplers on these 30-ton mine cars give protection from haulage jolts and jerks by absorbing that punishment in durable rubber draft gear.



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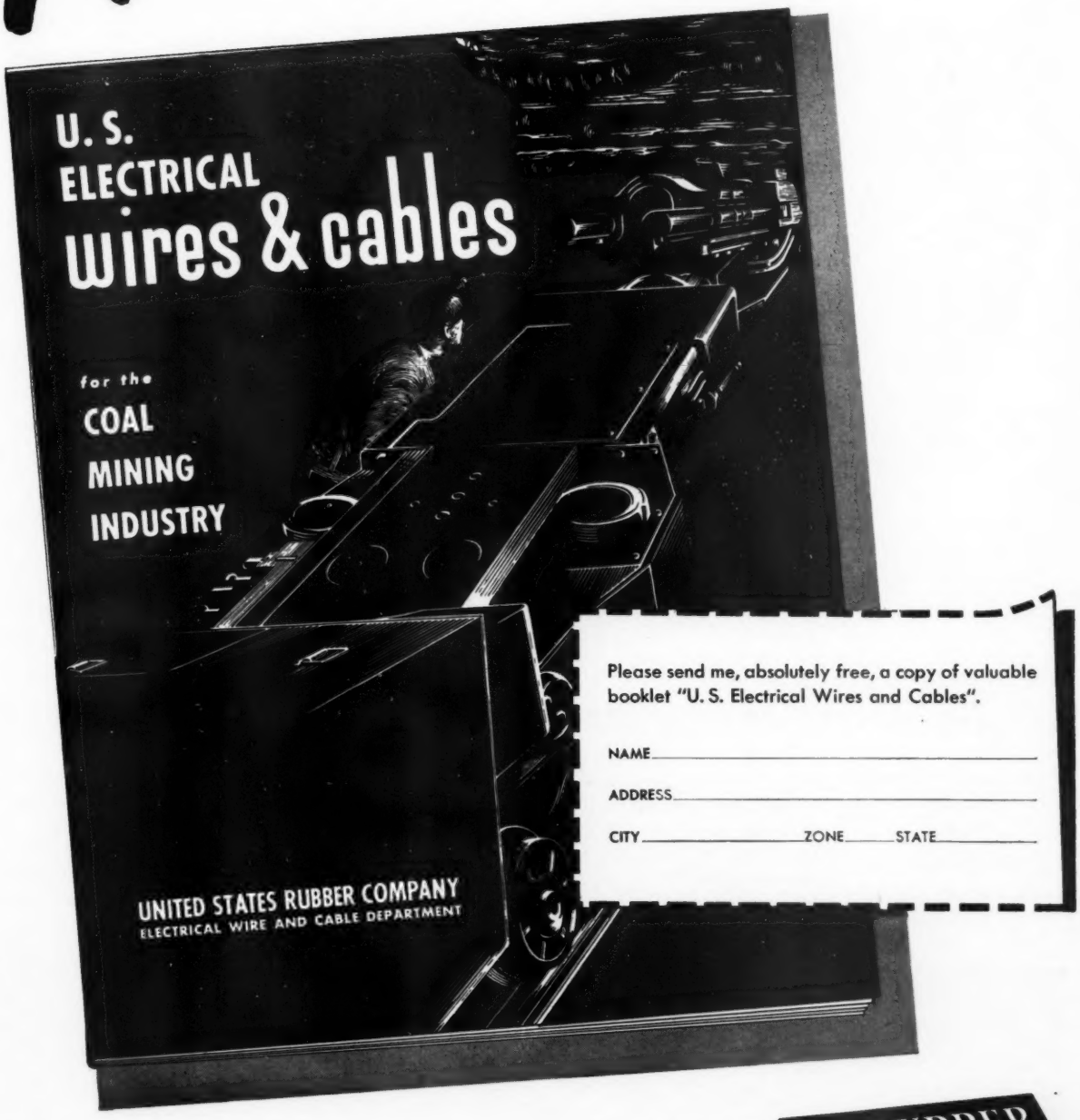

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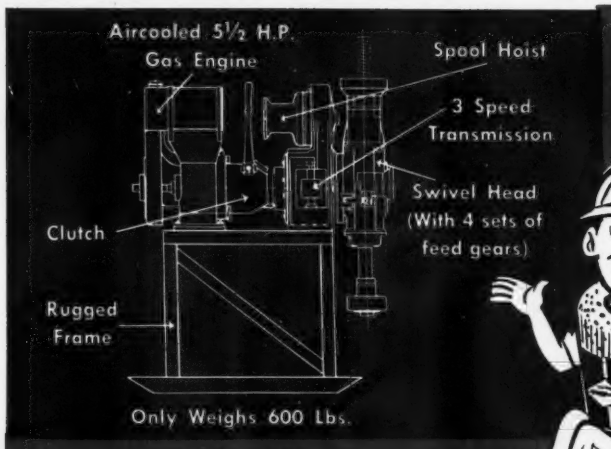

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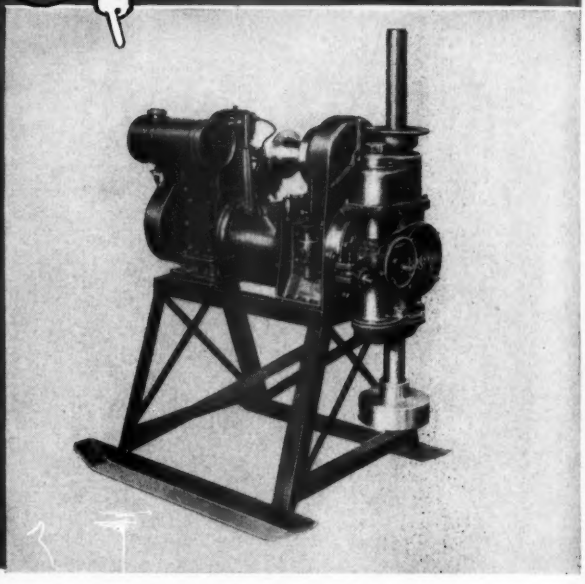

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. . . a triple-purpose precision instrument for testing electric blasting operations

The Du Pont Voltohmeter is an entirely new, all-purpose precision instrument designed for testing in connection with electric blasting. It combines the functions of Du Pont Blasting Galvanometers, and Detect-A-Meters, and offers many other advantages.

1. **As a blasting galvanometer,** the Voltohmeter may be used to measure resistance of electric blasting caps, blasting circuits and firing circuits accurately. One dial setting has a range of 0 to 100 ohms, and another, from 0 to 1000. The scale is graduated for easier, more accurate reading, and a convenient zero-mark adjustment is provided.

2. **As a stray-current detector,** the Voltohmeter offers greater flexibility in detecting, tracing and identifying both AC and DC voltages. Separate scales are provided reading from 0-1.5 volts DC, 0-1.5 volts AC, 0-30 volts DC and AC and 0-600 volts DC and AC.

3. **As a voltmeter,** the new Voltohmeter may be used for testing all power-line voltages commonly used in electric blasting operations, up to 600 volts . . . both AC and DC.

Each Voltohmeter is in a sturdy leather carrying case with shoulder strap and pocket containing two plastic insulated probe wires with insulated alligator clips shown below. An instruction plate and pamphlet are also included. Compact, it measures only 6⅝ x 3⅞ x 4½ inches; weighs only 2½ pounds.

Ask the Du Pont Explosives representative in your district for complete information about this new, highly efficient, triple-purpose instrument for promoting safer blasting. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

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DU PONT

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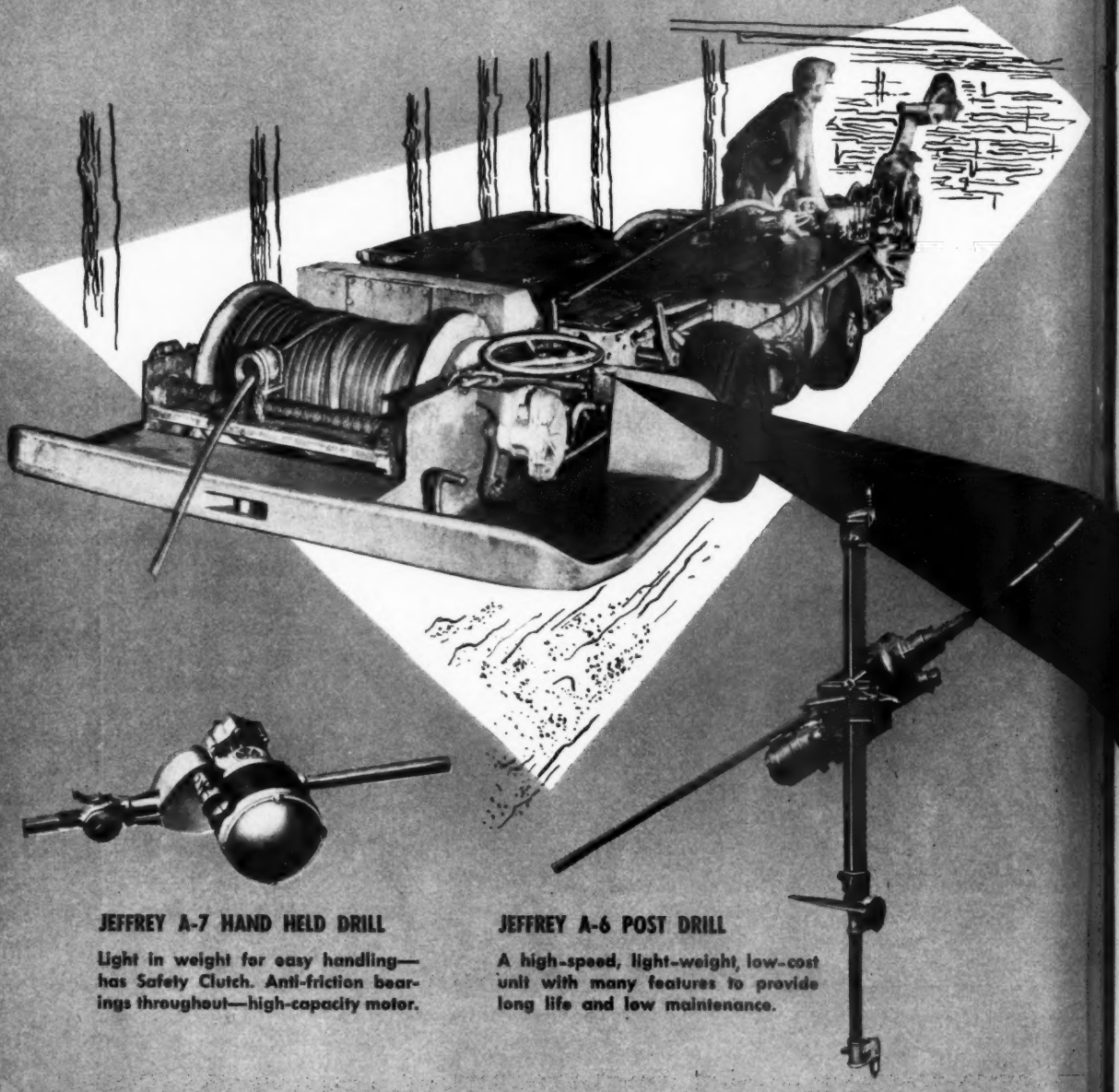
high-speed drilling in modern trackless mines with

JEFFREY DRILLING MACHINES

The Jeffrey 56-FHR Drilling machine, illustrated below, is completely hydraulic in operation. With many adjustments, it affords the utmost flexibility of operation in swinging the drilling head in any desired position—quickly, easily and accurately—for shot hole placement. For modern, high-speed drilling specify the Jeffrey 56-FHR unit. Write for complete details.

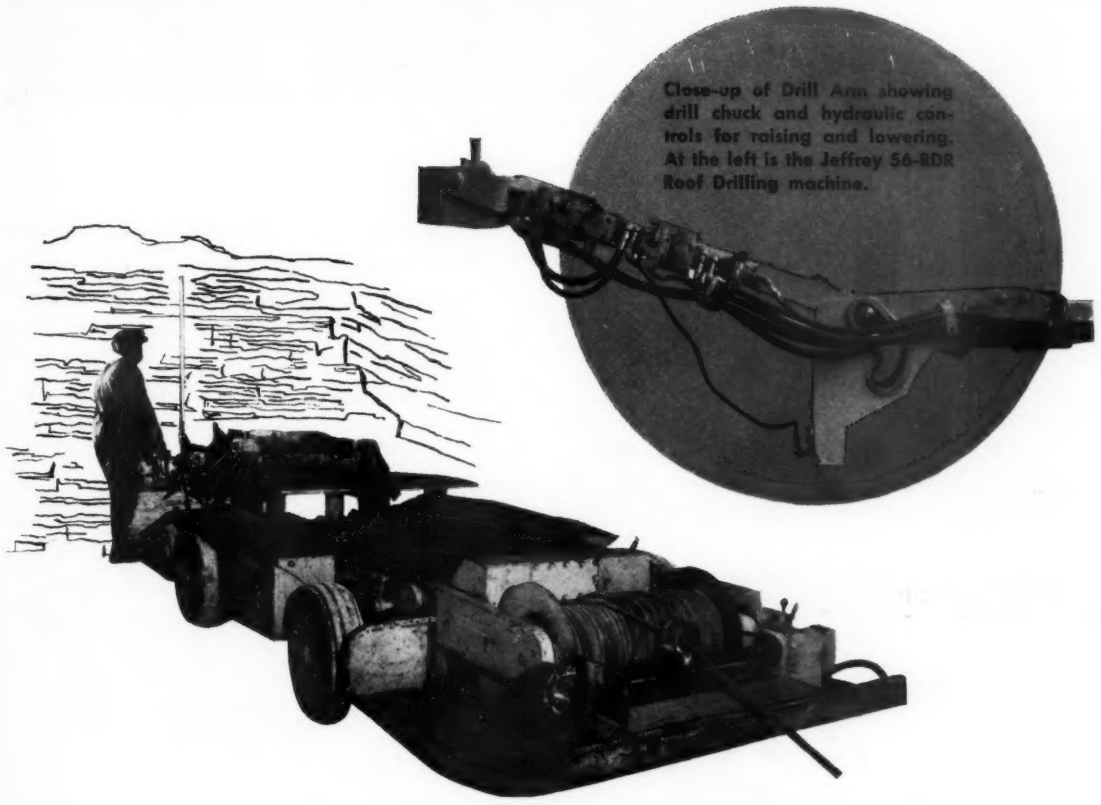


JEFFREY A-7 HAND HELD DRILL

Light in weight for easy handling—has Safety Clutch. Anti-friction bearings throughout—high-capacity motor.

JEFFREY A-6 POST DRILL

A high-speed, light-weight, low-cost unit with many features to provide long life and low maintenance.



Close-up of Drill Arm showing drill chuck and hydraulic controls for raising and lowering. At the left is the Jeffrey 56-RDR Roof Drilling machine.

. . . and high-speed roof drilling for roof bolting operations

JEFFREY ROOF DRILLING MACHINES

The Jeffrey 56-RDR Roof Drilling machine has a rubber-tired truck and a drill boom which is swung horizontally and raised vertically by hydraulic power. Hydraulic motor drives drill socket as well as torque wrench used for anchoring and tightening bolts. A straight-line feed for the drill is maintained at all times. When swung horizontally the boom provides a reach of 10' 10¼" maximum right and left. Bulletin No. 831 goes into more detail. Send for it.

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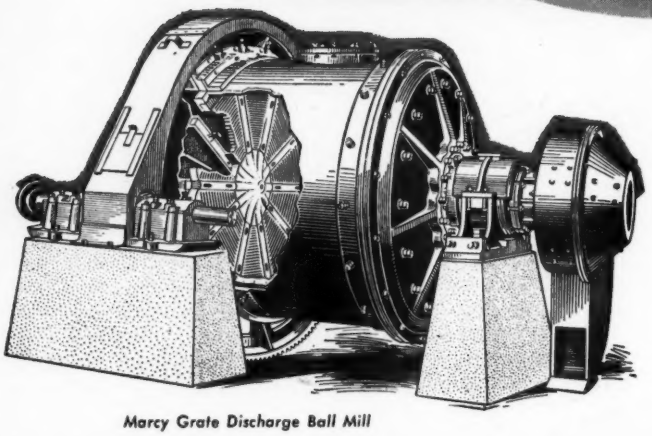
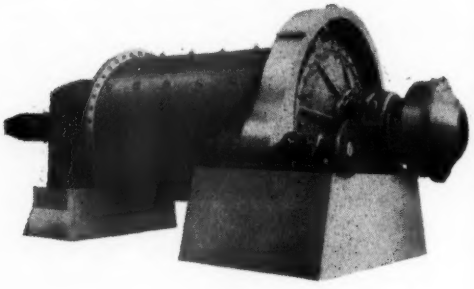


Marcy Grate Discharge Ball Mill

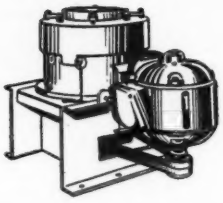
For Wet or Dry Grinding of ore, cement, clay or fibrous materials. Types, sizes and capacities for from 5 tons up to 3000 tons per 24 hours. Marcy Grate Discharge Ball Mills and Open End Rod Mills have unique features resulting in quick discharge, maximum useful grinding, minimum overgrinding and better metallurgy. Used throughout the world.



Marcy Open End Rod Mill

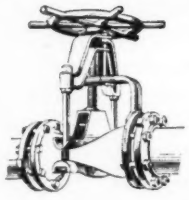
Massco Gy-roll Reduction Laboratory Crusher

Reduces ½" feed to as fine as 10 mesh in single pass. High capacity with low power consumption. 6" and 10" sizes.



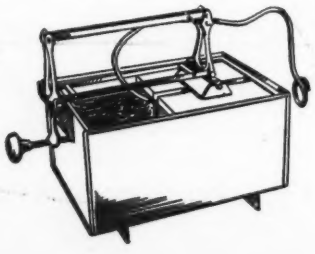
Massco-Grigsby Rubber Pinch Valves

Designed for abrasive and corrosive pulps. Patented hinged sleeve for longer wear. 1" to 12" diameter. Up to 150 pounds continuous pressure.



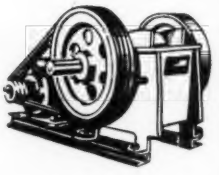
Massco-Adams Reagent Feeders

For wet reagents and other liquids. No mechanically driven moving parts. Only one micrometer screw adjustment. Siphon principle. Requires no electrical connections.



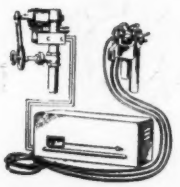
Massco Laboratory Jaw Crusher

Welded steel frame; manganese steel jaw and check plates; bronze bushed bearings; smooth jaws give better product and easier cleaning. Adjust for plate wear by convenient hand wheel adjustment.



Massco-Adams Density Controller

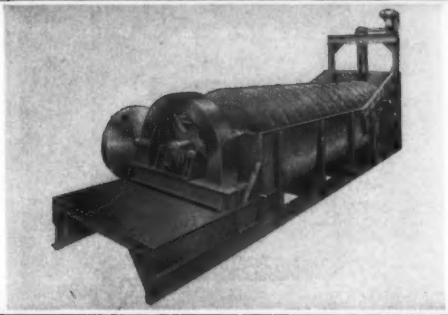
Automatically regulates water dilution of pulp in grinding circuit to maintain constant percent solids—thus, controls size of finished product.



cost-cutting equipment

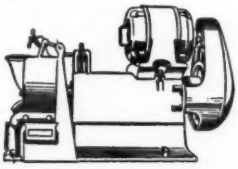
Akins Classifiers and HMS Separators

Akins Classifiers are made in sizes from 12" to 84" dia., simplex and duplex. They are used for classification of solids by size, dewatering, washing coal, preparation of china clay and glass sand, desliming and de-oiling phosphate rock, sink-float concentration. Used throughout the world by hundreds of the best companies in the mining and process industries.



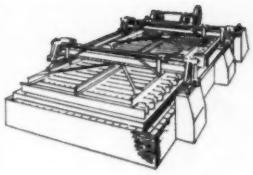
Massco-McCool Pulverizers

Disc type grinder with planetary movement. No gears. Will grind to 150 mesh in one pass.



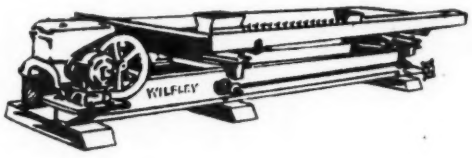
Lowden Dryer

For drying flotation concentrates, graphite, clays, ground minerals, paint fillers, pigments, various precipitates. Can use most any fuel including live steam and waste heat.



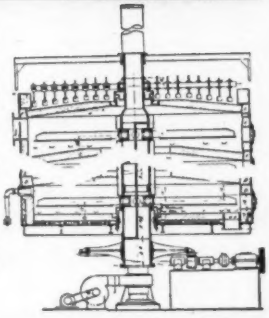
Wilfley Tables

For separation of any ore or material amenable to gravity concentration. Laboratory and commercial sizes—up to 180 tons capacity per 24 hours.



Skinner Roasters

For roasting and calcining ores, clays, limestone, limestone mud; decomposing oil sludge in process of producing sulphuric acid; incinerating sewage and garbage. Coal, oil or gas fired. Sizes to 22' inside diameter; up to 12 hearths.



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Editorials

JOHN C. FOX, *Editor*

SEPTEMBER, 1953

Give-Away?

RECENTLY, we in the mining industry, and the public as a whole, have been subjected to a barrage of propaganda from those who characterize our basic mining laws as obsolete and archaic. Phrases such as "The Big Land Grab" are loosely intermingled with misrepresentations or half-truths that overlook completely what our system of mining laws has meant to the development of our mineral resources. Proposals are freely advanced that would, in effect, amount to socialization or nationalization of the mineral industry.

Such proposals are directly contrary to the system of development by private enterprise. The Federal mining laws were enacted with the intent that minerals in the public domain be discovered and developed by free individuals and large or small companies. As an incentive and reward for assuming the risks inherent in the winning of metals and minerals from the reluctant earth, these laws grant—after a valid discovery, a specified minimum of development work, and other requirements—a fee simple title to the land containing the minerals discovered.

These laws have been in effect for many years and are supported by numerous court decisions. They are understood by miners. They have effectively carried out the purpose for which they were enacted.

The cries of "give-away" and the charges that existing mining laws are archaic are based almost entirely on instances where persons, not members of the mining industry, have located invalid or fraudulent mining claims, with no real intent to undertake mineral development. That they may have been able to occupy parts of the public domain for non-mining purposes, is not the fault of the laws. Rather the blame rests on those who are lax, or worse, in discharge of their duties to enforce these laws, and to take action against non-mining locators.

We recognize that changing times may require changes, even in laws. But in laws pertaining to property rights, valid titles must be protected. Some clarification and strengthening of the existing laws, to remove the incentive for fraudulent locations that has developed as a result of non-enforcement for some twenty-five years, may be in order; but the basic principles of these laws should be maintained.

Mineral deposits are not so easily found as they once were. Exploration and development cost more. Ore in the mines of tomorrow will probably carry fewer pounds of metal per ton so the mines will, of necessity, cover greater areas. Our established mining laws have contributed, and are contributing right now, to the discovery and development of mineral resources in the public domain—resources vitally needed for our normal economy and our national defense. These are some of the factors that should be taken into account when amendment of existing mining laws is proposed.

As to their constituting a "give-away," a look at the record of federal, state and local taxes paid by mining companies, large and small, should dispel that idea. A look at the industrial development which has made this country the world leader it is today—all based ultimately on the use of our natural resources under the free enterprise system—should explode that myth. A comparison of wage scales and living standards of American miners with those in countries where the State controls mining should silence the "give-away" cry.

When under the existing system of Federal mining laws a person is granted the right to gamble his all, to go through years of toil and disappointment on a plot of ground in the public domain and is guaranteed only that he may call it his own—provided he meets the requirements of the law—and then returns to his community, his state and his nation as much as our mineral industry has done, he can scarcely be accused of getting something for nothing.

Wet roof, soluble compounds in rock and a negative trolley system combined to produce this stalactite

Reversed Polarity for Mine Circuits

Recent Experience and Experiments with Negative Trolley Point Up the Problems and Dangers Associated with Such Systems

By H. B. BUCKINGHAM

Engineering Department-Raw Materials Division
United States Steel Corp.

THE Tennessee Coal & Iron Division of the United States Steel Corp. operates five underground coal mines near Birmingham, Ala. Three of these, Hamilton, Docena and Edgewater, are much older than the other two and use motor-generator sets for conversion of AC to DC power. In addition to the m-g sets, one rectifier was installed at Edgewater in 1950. These mines have the negative side grounded and a positive trolley. Short Creek, which began production in 1942, and Concord which followed in 1946, are powered by 300-kw mercury arc rectifiers. At both of these mines, the trolley is negative and the positive is at ground potential.

Reasons for Negative Trolley

Before 1938, rotating conversion equipment was used almost universally in the mining industry for DC power. This equipment was nearly always grounded on the negative side with a positive trolley.

About 1938, the ignitron tube mercury arc rectifier was developed for mining service. These rectifiers had three advantages over rotating units:

(1) Higher efficiency, especially at partial load;
(2) Lower maintenance costs, and
(3) Improved performance and convenience.

Consequently, rectifiers had a wide acceptance in the mining industry. These early rectifiers were built for a negative trolley only. Hence, the beginning of large scale negative trolley installations.

The ignitron tube is a commutating device in series with the load and is not a power source. The anode of the tube is positive with respect to the AC source and the cathode is negative with respect to the anode, but the cathode is positive with respect to the load. In rectifier terms, the cathode is positive. The tube shell or jacket is at the same potential as the cathode. If the cathode is the grounded side of the circuit, then it is more convenient to have the cooling water system and heat exchanger at ground potential for safety from electrical shock and elimination of electrolysis problems in the water system. This is the primary reason why manufacturers built the early rectifiers for a negative trolley.

Four of these rectifiers were installed at Short Creek mine in 1952 and connected for a negative trolley. Nine rectifiers were installed in the new Concord mine beginning in 1946 and were also connected for a negative trolley. All rectifiers purchased during or after 1949 were built and insulated so that either the positive or

negative circuit could be grounded.

Information from the U. S. Bureau of Mines shows that there are 96 mines in the United States operating with a negative trolley system. Their distribution by states is as follows:

West Virginia	57
Pennsylvania	13
Virginia	8
Ohio	8
Kentucky	7
Alabama	2
Illinois	1

A comparison of the reversed and conventional DC power systems using rectifiers is summarized in the following:

Negative trolley—Positive ground

(1) The negative trolley contributes to excessive insulator and cable insulation failures because of electrical endosmosis and foreign material in the air stream.

(2) A negative trolley has some advantages from a safety standpoint because the heat exchanger, water system, and ignitron tube shell are at ground potential. However, these parts can be shielded if the negative is grounded.

(3) If sodium salts are present in the roof strata, in presence of moisture current leakage deteriorates the roof and deposits salt compounds in the form of caustic soda on the hangers. In some cases, metallic sodium has been found inside the hanger pipe. This is a hazard. Caustic soda with moisture, or sodium hydroxide, has a definite deteriorating effect on the insulator and can cause skin burns to personnel.

(4) No electrolysis problems are present on the water piping system or heat exchanger because these parts are at ground potential.

(5) All negative trolley systems do not give the same troubles. The most severe disadvantages occur where moisture and sodium salts occur in the roof.

Positive trolley—Negative ground

(1) The heat exchanger, water piping system and tubes must be insulated from the rectifier frame or ground.

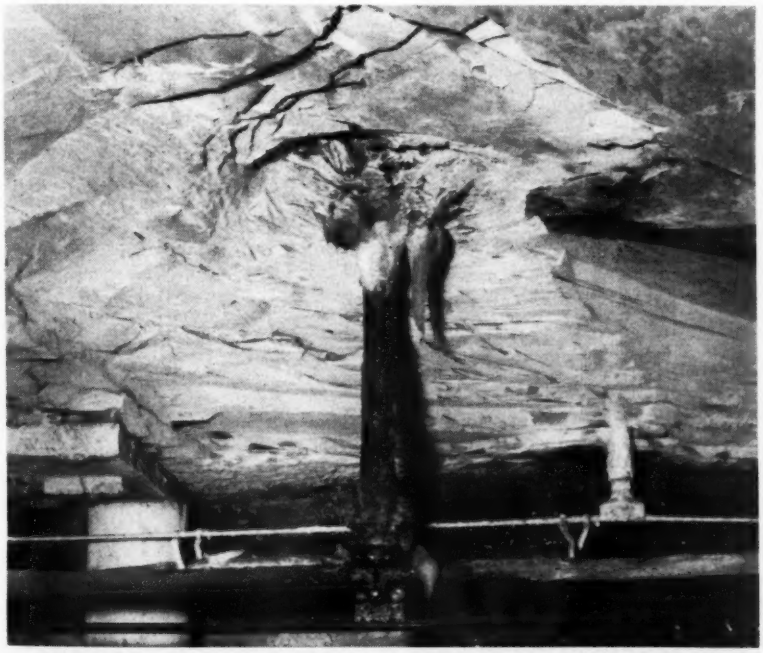
(2) As these items are at positive trolley potential, they must be screened or shielded to reduce possibility of electrical shock.

(3) This system has several important advantages from standpoint of electrolytic corrosion to structures, pipe lines, etc.

(4) A positive trolley system does not cause roof deterioration nor formation of caustic soda or metallic sodium.

(5) Electrolysis problem of rectifier water piping system can be overcome by use of insulating joints and expendable targets connected to the anodic sides of the insulating joint.

This paper was prepared and is published at the request of the American Mining Congress Committee on Underground Power. At a meeting on June 11, 1953, the Committee commended Mr. Buckingham's article and recommended, by a majority vote: (1) against the use of negative trolley systems for mining services unless there is some special reason for such an installation and (2) that companies now experiencing corrosion, electrolysis, or other difficulties due to negative trolley should give consideration to converting to a positive system. Such change should be made only after consultation with the manufacturer of the original equipment.



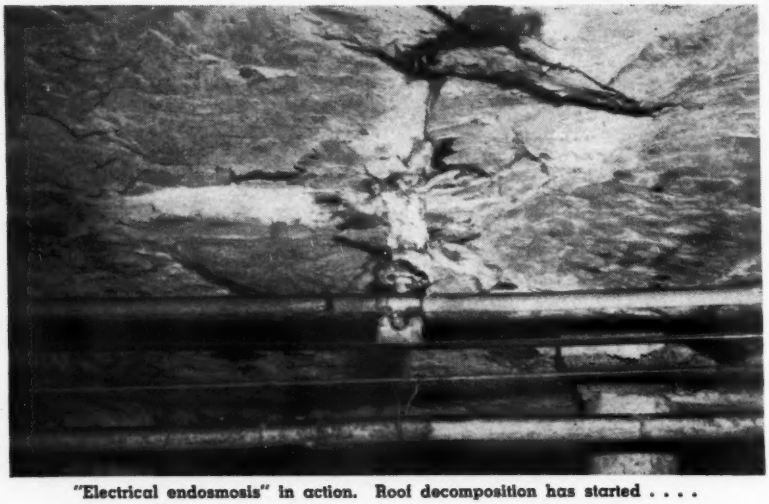
When current path is established through moist coal and rock dust deposit on hanger insulation, electrolysis begins

Experience with Negative Trolley Systems

During the second year of operation of the first negative trolley installation at Short Creek, it was apparent that the insulator and insulation failures were excessive as compared to the positive trolley mines. Investigation and study of this problem revealed that most of the troubles were a result of electrical endosmosis. The theory of electrical endosmosis is that the negative potential tends to attract ions and, if moisture is present, it tends to attract the moisture to the negative circuit. Under this condition, insulation, which is susceptible to difficulty from moisture, can deteriorate, sometimes very rapidly.

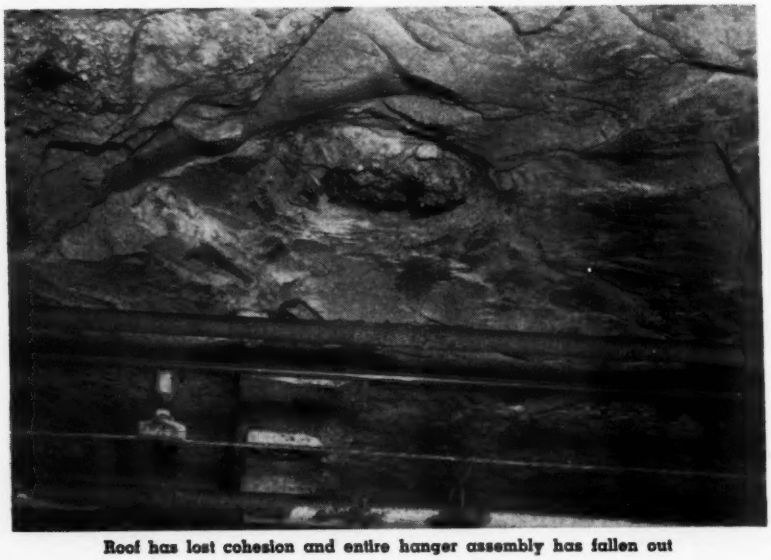
The majority of hanger insulators on the trolley system was heavy with moisture and water droplets on the faces of the insulators and protective shells. It was found that successive layers of rock dust and coal dust were adhering to the faces of the moist insulators and gradually creepage paths were tracked or carbonized across the insulators to the metallic shells. With the insulators bridged across, current circuits were established to the roof. This condition set up heat, electrolysis and chemical action in both the insulator and roof.

After a hanger insulator is bridged by moist coal and rock dust and a creepage current path is established to the roof, electrolysis begins. This condition causes corrosion of the hanger metallic parts and heat that gradually softens the insulating compound of the hanger until the supporting pin drops out, allowing the trolley wire to swing free. Over a period of time,



"Electrical endosmosis" in action. Roof decomposition has started . . . .

A large cavity has formed and metal hanger is badly corroded . . . .



Roof has lost cohesion and entire hanger assembly has fallen out

usually six months to three years, the roof shows marked deterioration from the passage of current. The affected area is about 12 to 24 in. in diam and is circular in shape, around and adjacent to the hanger pipe. The roof rock loses cohesion, becomes soluble and drips down the hanger pipe to the insulator, forming large white incrustations. In some cases the roof may start falling out in small chips. In others it seems to "carbonize" and take on the appearance of hard mud.

The roof continues to decompose until the hanger pipe loses its support and eventually falls. Samples of the incrustations were analyzed and found to be predominantly caustic soda which caused further deterioration of the insulating compound of the insulator. After this discovery, workmen were warned to observe the necessary precautions.

Corrosion Tests and Findings

Insulator failures increased and, in June 1952, TCI's electrical laboratory was requested to make corrosion tests. A failed insulator assembly was obtained from Short Creek mine. This assembly included a 14-in. length of hanger pipe. The pipe was being washed out in the laboratory sink when there was an explosion inside the pipe. From chemical analysis, the pipe was found to contain metallic sodium. This substance reacts violently with water.

The discovery of metallic sodium presented a situation of the utmost gravity and an immediate study was begun by a committee of qualified technicians. Physical conditions at the spot were studied. Numerous samples were taken for chemical analysis. Shortly thereafter, similar inspections were made at Concord mine where the trolley wire is negative and at Edgewater mine where the trolley is positive.

No metallic sodium was found in any of the other samples; however, high percentages of caustic soda and sodium carbonate were found in all Concord and Short Creek deposits. Neither of these compounds was found associated with the positive Edgewater hangers. The Edgewater hanger samples did show sodium sulphate. This indicated that no chemical electrolysis had taken place at Edgewater mine.

Generally, the same conditions were found at Concord as at Short Creek except that the deposits on hangers were not as massive and had not progressed to the same stage as at Short Creek. There, approximately five to 10 percent of the hangers were affected by chemical accumulation. At Concord only about one percent was affected.

To determine leakage current over failed or faulted insulators for the entire Short Creek mine, the following tests were made:

(1) All lights, heaters and motor loads were disconnected from the trolley in all parts of the mines.
(2) All rectifiers except one were disconnected from the trolley.
(3) Readings of voltage and load current were taken at this rectifier.

The current was highly variable, averaging about 150 amp at 290 v. This corresponds to a power loss of 43.5 kw or 1044 kwh per day. Short Creek has 50,000 ft of installed trolley wire, including side tracks, and approximately 6000 installed trolley hangers.

Similar conditions were occurring in other mining districts and complaints became numerous. In April 1949, Subcommittee TP-12, of the National Association of Corrosion Engineers, appointed to study electrical grounding practices, made the following recommendations:

(1) Negative grounding of dc traction power equipment, including rectifiers, is preferable from the standpoint of avoiding stray current electrolysis.
(2) New installations of dc power supply equipment should be grounded on the negative side.
(3) Every consideration should be given to converting existing positive grounded systems to negative ground.

The American Mining Congress began investigations on this subject at about the same time and later endorsed the NACE recommendations.

It will be noted, however, that both organizations were concerned with the corrosion and maintenance aspects of the problem. It was not recognized that a personnel or fire hazard might be involved.

Even as recently as December 1952, the MINING CONGRESS JOURNAL published a note on this subject in which the AMC Power Committee endorsed the findings of the NACE committee, but again no mention of metallic sodium or caustic soda was made.*

Plans for Conversion From Negative to Positive Trolley

At the same time the above investigation and tests were being conducted, another type of investigation was in progress. This was started initially by correspondence and later by conferences with manufacturers of trolley insulators and power rectifiers. Tests and trials of different makes and types of insulators were begun and have resulted in at least one insulator manufacturer improving the quality and di-electric of its insulator. This will be advantageous even for positive trolley installations.

After conferring with the rectifier manufacturer's representatives, a joint inspection was made of the old and new type rectifiers by the representatives and company engineers. The purpose of this inspection was to determine exactly what changes would be involved if the rectifier polarity were changed.

These necessary changes to the rectifier are:

(1) Insulate the temperature regulator equipment from the rectifier frame (this includes the heat exchanger, circulating pump, blower fan and motor and piping).
(2) Insulate the cathode bus from ground.
(3) Install insulating hose from piping to ignitron tube jacket.
(4) Install copper connections from cathode bus to main dc contactor.
(5) Make minor miscellaneous changes to control wiring.
(6) Install copper cable from rail circuit to neutral of power transformer.
(7) Install protective screens on dc car to protect personnel from danger of shock from exposed energized parts that were formerly at ground potential.

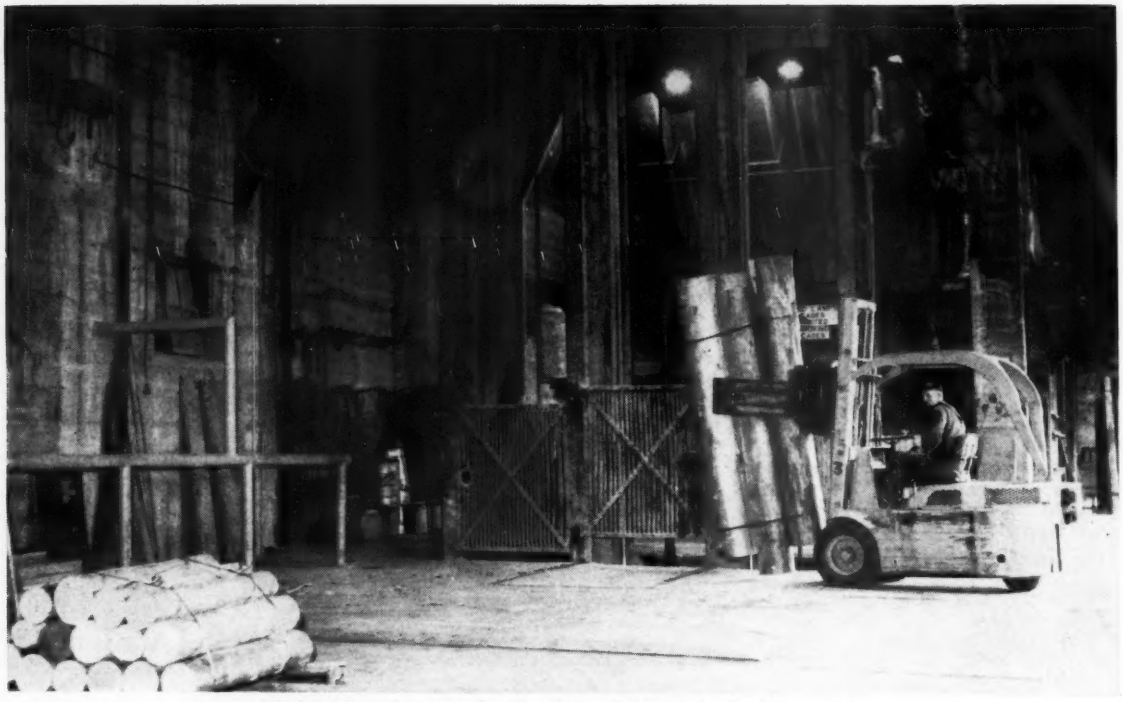
Thirteen rectifiers will require these changes, four at Short Creek and nine at Concord. Four other rectifiers, three at Concord and one at Short Creek, will require only minor changes because they are of recent manufacture and were built for either polarity.

In addition to changes to the rectifiers, it will be necessary to reverse polarity on electrolytic condensers, rectox units and make minor changes to wiring of automatic block signals, electric track switch controls and traction communication equipment.

After studying all the facts and circumstances concerning a negative trolley installation, it was clearly indicated that the negative trolley should be changed to a positive trolley. Accordingly, the decision to change was made. Materials are on order and the necessary drawings are being made.

Because the rectifiers are in service during the week, it is planned to make all insulating and screening changes to them on successive week-ends. After all these changes have been made, the necessary changes will be made on all rectifiers at Short Creek the same week-end resulting in a positive trolley operation the following Monday. Similar changes will be made to the rectifiers at Concord the following week-end, thus completing the conversion from negative to positive trolley operation.

* Subsequent action has been taken as noted in the box on page 19.



"Grab-jaw" truck rotates bundle of round timbers for loading on cage

Packaged Timber Handling at Hecla

Fork-Lift Trucks, Pallets, Steel Straps and Ingenuity Reduce Labor Costs by As Much As 70 Percent at Large Western Mine

By W. H. LOVE
Superintendent
Hecla Mining Co.

AT any mine, material handling is a big operation and the Star mine at Burke, Idaho, is no exception. Located in the Coeur d'Alene, the Star is owned by the Sullivan Mining Co. and operated by the Hecla Mining Co. In addition to the Star, the Burke surface plant also serves other Hecla operated properties in the area; namely Polaris, Silver Summit, Metaline Mining and Leasing Co., and Hecla-Atlas operations. It is evident that material handling is indeed a big operation here.

At the Star mine, the mining method may be called timbered cut and fill, and timber consumption in the stopes is very high. The Star is developed through an 8600-ft long crosscut driven from the 2000 level station of the Hecla mine, which ceased operations in 1944. The 2000 level of the Hecla connects with the 4000 level of the Star mine, where mining is done from a 3000-ft shaft raise and a 2300-ft winze.

Use 128 RR Cars of Timber

To give some idea of the volume of timber and other supplies consumed at the Star mine, in 1951:

(1) 1,255,000 fbm of lagging, and 1,550,000 fbm of slide boards, chute timber, headboards, and ties were used—a total of 2,805,000 fbm of dimensioned timber. Or, at 22,000 fbm each, 128 flatcar loads.

(2) 295,000 lin ft of various sizes of stull
(3) 1345 kegs of nails
(4) 5400 cases of powder

Add to the above the myriad other items of equipment and supplies and you have a big materials-handling job. In addition, it should be noted that the largest share of the timber must be procured and stored at the mine during the relatively few summer months, because of severe winter conditions.

Formerly all the dimensioned timber—2,800,000 fbm a year—was handled entirely by hand. At the Star, a carload of lagging, for example, was unloaded piece by piece from flatcar to storage area. This alone required a crew of six men, a full shift or better to accomplish. From the storage area, lagging was loaded on a timber truck, again a piece at a time, and taken to the collar of the Hecla shaft. Here it was loaded on cage decks, lowered to the 2000 and reloaded on timber trucks for transport to the Star mine, a distance of 8600 ft.

Here it was loaded into cages at the Star shaft raise or Star winze and taken to the working level. It was unloaded and again loaded on timber trucks for final transport to the working place. This transfer of material from Hecla dump to Star stope means no less than six separate handling operations—and when each piece of lagging is handled separately it means excessive amounts of handling labor.

Stull were unloaded from flatcar

to storage area by a Brownhoist steam crane, thence, by timber truck to the sawmill. After being cut into caps, posts, etc., these too were handled a piece at a time and followed the same path in reaching the working place as the dimensioned timber discussed above.

There existed a real need for mechanized, streamlined, methods of handling timber and supplies at the Star. The rising cost of labor, plus a shortage of available manpower, served to accentuate this need.

Began with One Fork-Lift Truck

Credit for initiating a program to package timber and palletize supplies for easy, fast handling belongs to R. W. Neyman, now general manager of the Hecla Mining Co.

Development of the fork-lift truck and its successful application in other industry pointed to its potentialities in the handling of packaged mine timber. The first machine purchased at the Star mine was a small 2000-lb capacity Hyster fork-lift truck. This machine was used for general utility work around the mine plant, and for experimental work in packaging. It was soon evident that packaging of timber and handling it by fork truck would be a great improvement over the costly handling by hand.

Equipment now used by Hecla includes five fork trucks, three of 2000-lb, one of 4000-lb, and one of 7500-lb capacity; four "grab-jaw" trucks of 4000-lb capacity for use in loading and unloading cages; a mobile rubber tired crane; a straddle truck, and a warehouse "runabout."

Stull delivered to Hecla are cut into caps, posts, girts, cribbing, stringers and poles at the company sawmill. These are assembled in bundles and strapped with two bands to make a package. The bundles are then taken to the mine storage area for later delivery into the mine. Lagging and all other dimensioned timber are cut at an independent sawmill and strapped prior to loading on flatcars for shipment to Burke. All packages are banded with two straps except headboards (20 in. and 24 in. long), which are banded with one strap. Acme steel strapping is used, ¾ in. by 0.029 in. in dimension. One buckle is required per band. In 1951 Hecla consumed 22,000 lb of this strapping, or 250,000 ft, and 19,540 buckles. To give an idea of the cost of packaging, the strapping and buckles to make up one bundle of lagging would approximate 21 cents. The size of the packages is governed by the size of the cages, and bundles average 28 in. by 40 in. by any length.

Cage capacity dictates bundle size

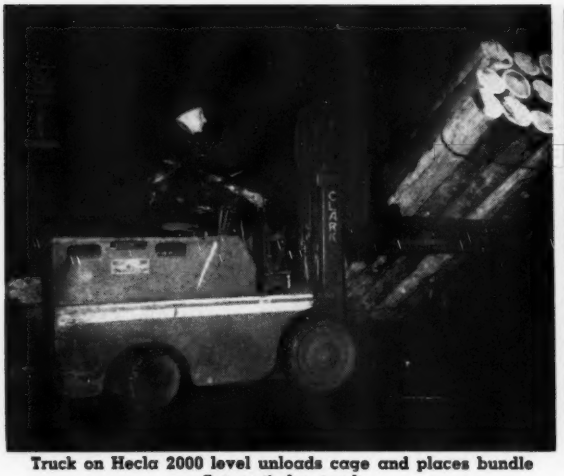
Save 46 Man-Hours

As mentioned before lagging and other dimensioned timber is delivered to the Star in packages on the flatcar. These packages are usually loaded three high, and the "75" Hyster, used for unloading, picks a stack of three at a time. The packages are unloaded and stacked six high in the storage area. To unload a car, two men take less than one hour, or, say, two man-hours. Contrast this with the old method where the same job cost 48 man-hours! It is also worthy of noting that there was no extra charge for banding at the sawmill—because of the handling saving which resulted at that point. Also, much labor has been saved in tallying both at mine and sawmill, due to uniform packages of known content.

Stull are delivered to the mine by flatcar and are unloaded through use of a portable high-line. Seven sets of skids are used, to accommodate 6, 8, 10, 12, 14, and 16-in. sticks. The car and the high-line are spotted at the appropriate skid and the car is cut loose. A double-drum hoist controls the hoist and travel of a large timber hook riding on the high-line, which conveys the logs from car to skid.

From the skids, stull are transported to the mill by a Hecla-made machine utilizing a fork-lift mounted on a carriage traveling on a monorail at right angles to and at the lower end of the skids. In operation, the carriage (with forks down) is stopped at the appropriate skid. The forks are elevated, picking up the desired stulls. These are then trammed by the self-propelled carriage to the sawmill, where they are lowered on to the mill skids. They are then cut, bundled and moved to the storage area.

Unloading a car of lagging now requires two man-hours, not 48 as in the past



Truck on Hecla 2000 level unloads cage and places bundle flat on timber truck

On Hecla 4000 level lagging is transferred from truck to cage

Supplies Ordered Daily

Each day, in response to the mine foreman's timber order, packages of timber are moved from storage area to headhouse—as near the shaft collar as possible. On the following morning it is loaded and sent underground. In order to load the packages of timber on the cage, it is necesary to rotate the bundles so that the longest dimension is vertical. This was necessary because of the small cross section dimension of existing shafts—44 in. between guides by 5 ft 4 in. Rotation is accomplished by use of an ingenious truck equipped with two grab-jaws which are capable of being squeezed together (to engage the bundle), elevated and rotated.

With this truck, packages are loaded on the Hecla shaft cage decks, each package constituting one deck load. On the Hecla 2000 they are removed by a Clark truck of like construction, except that it is battery-powered. Each package is placed on a timber truck and thence transported to the Star. The cycle is repeated in reverse at the Star winze or shaft raise, as the case may be. At the working level, each package is removed by an air tugger, with a hook, and is placed on a timber truck for final transport to the stopes.

Pallets Save Work

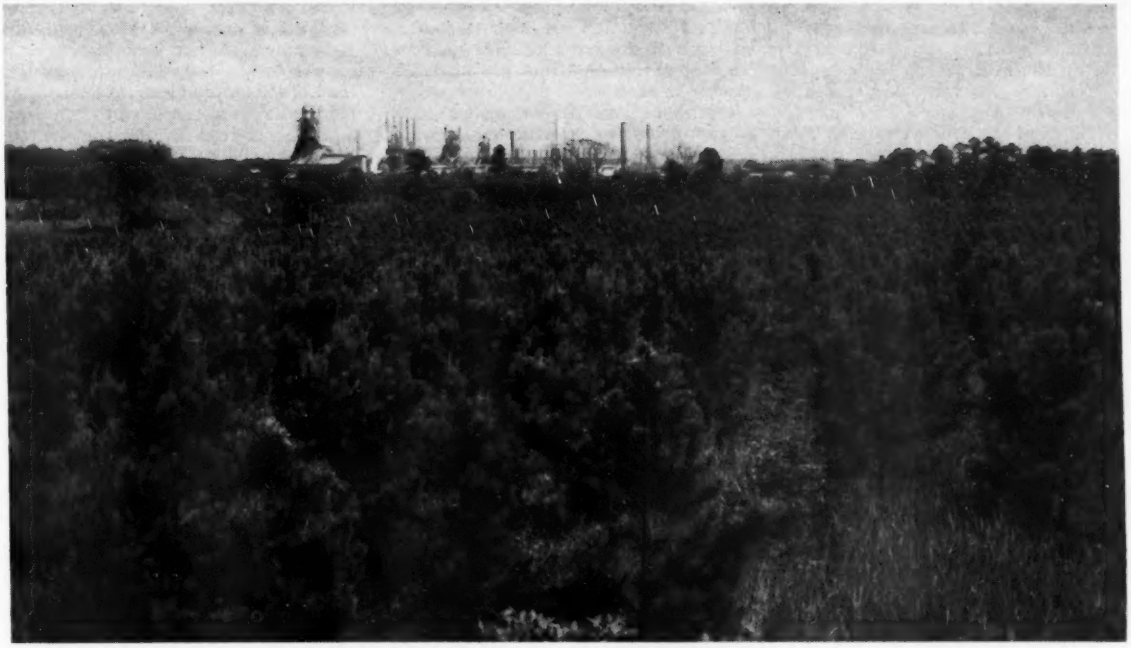
Nearly every other item used in the mine is handled mechanically. Nails are palletized during unloading from the car and are handled by fork truck exclusively from that point on. They are stored on pallets in the warehouse, taken from storage and sent into the mine, still on pallets. Powder is another example. It is delivered by truck, already on pallets. Unloading, transport into and out of the magazine and into the mine is all done by fork truck, 30 cases to a pallet. Powder is not handled by individual cases until it reaches the working place.

The fork truck is also used to handle rock drills, slushers, steel, pumps, mucking machines, fans and every other item of bulk or weight. The Hecla warehouse is so arranged that aisle space is ample for truck operation, and the elevator between the warehouse main floor and basement is large enough to accommodate the handling equipment. A small "run-about" type truck is also used to service warehouse needs of various shops.

The straddle buggy mentioned earlier is used to move large bundles of timber, rail, shaft timber, pipe and various other items. It was bought primarily to service outside properties such as the Silver Summit and Atlas, but has also found much use around the plant at Burke. Consider the case of handling 70-lb rail, 30 ft long, at 700 lb each. The straddle truck performs jobs like this with ease.

To finally illustrate the gain in efficiency due to handling methods improvement, labor cost of handling stulls was cut 30 percent, and the handling of lagging 70 percent.

Trucks handle 30 cases of powder at a time on pallets



These six-year-old pines, over which the Woodward Iron Co. plant at Woodward, Ala., is visible, represent a real investment in the future

Tree Farming in South's Mining Areas

First Planned to Supply Mine Timbers, Forestry Programs Have Grown into Profitable Business for Mining Companies

By EDWARD L. DE MOTTE
Southeastern Manager
American Forest Products Industries, Inc.

SOUTHERN mining companies first espoused the cause of forestry to supply their own timber needs. Paradoxically enough, the ultimate success of their forestry programs will result in the purchase by many of them of practically all props, ties, cross-bars, capboards and other wood needs from outside sources.

In Birmingham, Ala.—the South's Pittsburgh and focal point for the practice of "coal and iron" forestry in Dixie—several mining companies have established intensive management over more than a half-million acres of timberland. Most of this acreage has been officially certified as Tree Farms and all of it will eventually be qualified.

Most of these companies have learned in recent years that forestry is not only an important adjunct to their mining operations, it is also a profitable proposition, paying sufficiently handsome dividends to be treated on a par with other operations. Realization of this fact is gradually changing their policies governing forest practices. The original aim of providing their own timber needs is becoming an incidental asset in a new goal of management to achieve maximum growth rate of the highest quality timber. In other words, make the timber earn the highest possible profits.

Outstanding feature of mining company forestry programs lies in their ability to utilize the poorer materials, permitting them to save the best timber to grow in size, quality and volume. Forestlands all over the South are being managed profitably as timber producing properties alone. Managed timberland can be much more productive and profitable than that which is allowed to grow wild.

This kind of thinking now controls forestry policies of most companies. In general, they have reduced their annual cut to substantially less than the timber growth in order to build up growing stock. Accepting the gospel that conservation is wise use, they are concentrating on removal of inferior trees from their forests for use in their own mining operations.

Return $10 an Acre a Year

As a result their woods are rapidly being cleaned up. Saplings, long suppressed by "wolf" trees, are shooting upward and taking on body. Openings, created by thinning in areas once apparently incapable of reproduction, are bristling with millions of seedlings. Average annual growth rates eventually will be at least doubled. Companies that own these well-managed woodlands can look forward to potential returns of close to $10 an acre a year from their tree farming efforts.

While there will always be cull trees for use in the mines, their number will

decrease sharply once the current clean-up operations are completed on all company lands. By that time the type of timber growing on company lands will be too valuable for use in the mines.

With one hand companies with Tree Farms will be selling high quality stumpage at good profit while with the other they will be buying low-grade material on the open market for mine timbers. So the practice of forestry by mining companies seems destined to put them out of the business of supplying their own timber needs from their forests!

It is even conceivable that the trend toward growing the "most of the best" will be accompanied by a similar change in land acquisition policies. At the Woodward Iron Co., where management recognition of forestry has probably reached a zenith, timber has already become an important element in current and proposed land transfers.

This development, no doubt, was influenced by the fact that last year the company harvested approximately 1,141,000 fbm of timber per man employed in the forestry department. Timber income is classed as capital gain.

Woodward's experience has been that ownership of surface rights as well as mineral rights greatly reduces the headaches of mining operations. The company has further determined that the practice of forestry on fee lands is essential to realization of full return on the investment.

The forestry division of Woodward enjoys an advantage uncommon to many companies. The Woodward family has long been conservation-minded. During the pre-forestry period, when many holdings were being drastically over-cut, this company was buying its mine timbers outside and leaving its forest lands practically untouched. Such a practice is not profitable in itself but it did leave fully stocked timber stands. Following the recommendations of a firm of consultant foresters, the company established a forestry division in 1945 headed by Everett A. McKnight, University of Georgia school of forestry graduate. With the full cooperation of management, directors and stockholders (most of whom had personal timber interests), McKnight quickly built up a small, efficient organization. It consists of an assistant chief (also a graduate forester), two timber markers and two rangers.

By 1947 all timber cutting on the company's 38,000 acres was being controlled by marking on a selective basis. Because the company timberland is well stocked, its cutting schedule just about equals annual growth. About 5,000,000 fbm a year are sold to outside lumber, veneer and other timber operating companies. An additional 2,000,000 fbm a year is cut by a contractor to supply almost all of Woodward's own timber needs. About 95 percent of the latter is hardwood and includes anything from a 4-in. blackjack up.

"Although we're cutting as much timber as we're growing every year," the chief forester points out, "we can look forward to even bigger profits in the future. Through selective thinnings we are constantly improving both quality and growth rate."

A glance at the record shows results being obtained through Forester McKnight's program. Last year, for instance, only 3773 acres were cut, yielding 6,848,000 fbm. On a per-acre-cut basis this amounted to 1815 fbm. As initial improvement thinnings are completed over all holdings the next cut (on better-grade timber) is expected to show a substantial per-acre increase.

"A pound of wood is worth more than a pound of pig iron" is a maxim that probably originated with Woodward management and it's not surprising that the forestry division rates a place in the company's annual report right along with mining operations.

More than 7000 acres of slash pine have been planted by Alabama Power Co. This three-acre tract is near Wetumpka, Ala.

Plant For Erosion Control

A surprising member of Birmingham's mining fraternity is the Alabama Power Co., which operates coal mines to supply its Gorgas steam plant, the Southeast's largest investor-owned steam power-generating center.

While the company owns a total of 80,000 acres of Tree Farms, a 16,000-acre tract is operated as a separate unit to supply the timber needs of the Gorgas mine. It was while acquiring these lands in the early 1900's that Thomas W. Martin, now chairman of the board, first developed an appreciation for timber resources.

Always interested in anything that would contribute to the welfare of the company and the development of the state, Martin first valued forestry as a means of controlling erosion. Since 1934 pine seedlings have been planted on a total of 7000 acres of company land. In 1936 the company even established its own nursery to supply a million seedlings a year for the continuing project. The few remaining idle acres of company land have not been planted because of the incendiarist problem in certain areas.

Practical profits of forestry are illustrated by the 16,000-acre Gorgas tract which supplies the million-ton capacity mine.

Before the advent of roof bolts, approximately 1,500,000 fbm of mine timbers and lumber were cut each year at a cost of $30 per thousand. Cost of the same materials on the outside market probably would average $60 per thousand—hence, an annual saving of $45,000!

All company timberlands are under the direct supervision of Forester John B. Graves, who is assisted by two graduate and one practical forester.

Current cutting policy is to remove not more than one-half the annual growth. Ultimate goal is a growth rate of 300 fbm per acre per year, which would bring an annual income of close to $10 per acre, less a management cost of roughly $1 per acre.

Alabama Power Co. gross profit from all its timberlands for 1952 was approximately $166,000. In addition, it realized a saving of some $27,000 by supplying its own timber needs (mostly at Gorgas mine).

"Even though we're still far short of our goal," observes Hitchcock, "forestry is already a very profitable operation."

Though relatively new in the field of forest management, Sloss-Sheffield Steel & Iron—recently made a division of U. S. Pipe & Foundry Co.—is making rapid strides toward bringing its 90,000 acres of timberland

into full production. Just two years ago young Jesse E. Miller joined the company as forester and has already built up an organization consisting of three other graduate foresters, one practical forester and two timber markers.

Establishing full control of all cutting done by four contract mills, the foresters mark all pine that is cut. In the case of hardwood they find it more practical to mark the better grades to be left and specify that the mills remove all other hardwood for props and other mine uses.

"Initial expenses of buying survey-equipment and fire-fighting equipment and establishing land lines," Miller explains, "is taking most of the profit out of our current income from harvesting. But forestry is paying its way even at this stage of the game and the volume of timber being left in the woods for growing stock is increasing at a rate of almost $150,000 a year."

Sloss-Sheffield is also aiming for the "most of the best" and is cutting conservatively on an improvement basis. For the next several years it will probably harvest only about 5,500,000 fbm per year while new growth already is some 10,000,000 fbm per year and the rate is rapidly increasing.

Company interest in forestry research is reflected by a cooperative agreement it entered into with the U. S. Forest Service. Under the agreement, Sloss-Sheffield gave the Forest Service surface rights on one full section and a 99-year lease on three additional sections for research studies in growth, management, silviculture and utilization.

The company has already launched a modest planting program and hopes to maintain a planting schedule of 500 acres a year until all its barren land is back in production.

Down in Florida the American Agricultural Chemical Co., which operates phosphate rock mines in Polk County, became interested in forestry about 1938 when it planted several thousand slash pine seedlings. Some of these first pine plantations have already been thinned for pulpwood and other uses.

Since 1938 the company has continued its planting operations and has set out several million trees on its Florida properties. All the firm's woodlands have now been brought under organized fire control. Natural reseeding is taking care of most of the reforestation work. In recognition of the company's activities, its 27,409 acres of woodland was certified as a Florida Tree Farm in 1947.

Reclaim Strip Land

The American Agricultural Chemical Co.'s forestry objectives are twofold:

(1) To utilize the land for continuing productive crops, and; (2) To reclaim land by planting trees on over-burden areas after strip-mining so that mined-out properties can be put back into the production of useful, money-making crops.

Company lands are leased to local cattlemen for grazing and to the Pierce Rod and Gun Club for game management. So enthusiastic have company officials become over forest management that F. R. Bergquist, manager of the firm's rock mines, has become a Florida Tree Farmer in his own right. Bergquist's 40-acre farm near Pierce, Fla., was certified last year.

Agronomists on the company's sales staff are encouraged to point up forest values to their customers not only in Florida but elsewhere through the South.

Another site where a mining company is espousing the cause of forestry is in central Arkansas, where geographic therapy in the form of green and growing pine trees is part and parcel of the mining operations of Aluminum Co. of America.

Even abandoned coke ovens are not immune from the forestry program of Sloss-Sheffield Steel & Iron Div. of U. S. Pipe and Foundry Co.

Thinning pine plantations of the American Agricultural Chemical Co. in Polk County, Fla., yields a cash crop of pulpwood

There this oldest bauxite mining firm in Arkansas and the largest in North America is finding that the planting of trees and good management of timberlands means a wealth second only in importance to the vast treasure of dingy gray bauxite deposited beneath the earth's surface.

Tree Farming to Alcoa means not only a profitable side line in terms of cash crops of timber, but also the best answer to a pressing erosion problem that unchecked would hamper mining operations and provide a perennial eyesore.

Alcoa's reforestation program, as it operates today, started early in 1939. Since that time the firm has planted about one and one half million seedlings on gigantic waste dumps caused by their open pit mining operations and on open fields.

Alcoa's interest in forestry dates back to the turn of the century. One of the first constructions at the 6000-acre site just west of Little Rock was a sawmill built in 1901, where for more than 30 years timbers and lumber needed for plant and housing construction were produced.

Today, the operation requires about 100,000 fbm of rough lumber each year for mine flooring and over 500,000 fbm per year for house repairs and mine buildings. Much of this lumber is grown in Alcoa's forest.

Only dogged determination has carried the company through to a successful forestry program, for, due to a soil condition, only about half of the seedlings planted survive. This is due to a high acid condition in the soil turned up in spoil dumps by strip mining. The waste dumps must be exposed to the elements for a period of at least three years following mining before the lignite acid is "leached out" sufficiently to sustain plant life and even then, in some cases, the mortality of young pine seedlings is high.

Alcoa officials have tried, with some success, spreading a layer of good earth over the lignite deposits in order to speed the time when plant life might prosper. They are now carrying on a series of experiments with the University of Arkansas in an effort to find a better solution to the problem.

All of the practices of good tree farming are followed at the Bauxite, Ark., operation. Fire lanes are maintained over the 7000 acres of timberland and the company has a fire protection agreement with the Arkansas Division of Forestry and Parks. Fire fighting equipment from the various processing plants and the city of Bauxite is on standby for forest fire duty.

J. T. Watters, works manager at Bauxite, reports only the best methods of selective cutting are employed in timber harvests so that natural reseeding will occur where possible and the timberland will approach a sustained yield basis.

He reports that in some cases the company is forced to clear off land to accomplish its mining operations. When this happens, the land is seeded just as soon as possible to get it back into production.

In addition to pine seedlings planted, Alcoa has set out yellow poplar, elms, maples and oaks on the city streets of Bauxite. Black locust seedlings for fence posts and mine timbers were planted on the waste dumps and along ditches shortly after World War I. In the 1940's black walnut and pecan seedlings were planted in the city.

Due to the progressive forestry work of Alcoa in Arkansas, areas that would have been unsightly heaps of erosion scarred lands are now rolling hills of green and growing cash crops of timber to the benefit of the company and the people of Bauxite and Arkansas.

Program Pointers

Other mining companies planning to establish their own timber management program might well profit from the experiences of these companies. Following are a few pointers, covering the bare essentials.

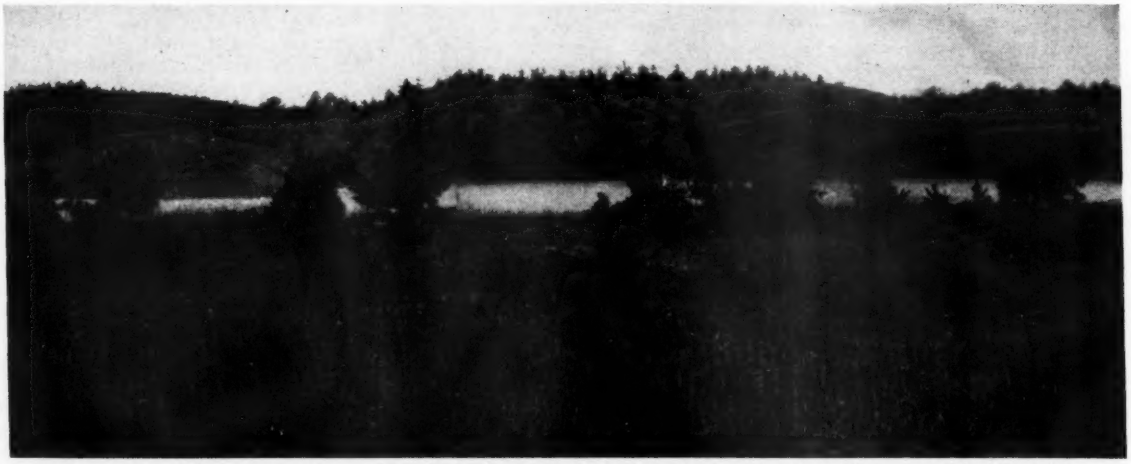
Minimum requirements should be established for both grade and species of various props, ties and timbers so wherever possible mining needs can be supplied from inferior trees, leaving the best trees to grow.

Plans should be developed by a forester, possibly with the assistance of a consultant, for definite cutting cycles and rotation of tree crops. Control of contract sawmills and outside loggers should be under full supervision of forestry division. Control should be exercised through marking of all timber and through rigid inspection.

Fire and trespass problems will require an active public relations program. It should be realized that good will resulting from a good timberland management program will be of value to the company as a whole. Certification of timberland as a Tree Farm as rapidly as the acreage is qualified and prominent display of Tree Farm signs will be an asset to the public relations program.

All in all, the task is not too difficult. Forestry operations will pay their own way and a handsome profit besides.

Obtain full information about tree farming by writing to American Forest Products Industries, 1816 N St., N. W., Washington 6, D. C.



Aluminum Co. of America puts its spoil banks back into production by planting pine trees after open-pit bauxite mining operations in Arkansas

Mobile electrical prospecting equipment includes high voltage generators; switchboard to measure volts, amperes, frequency; oscilloscope with recording camera and field radio

Geophysical Prospecting

Mining Geophysics, Still in Its Infancy, Has Proved Its Worth, But the Mining Industry Has Lagged in Financing Research and Development

By E. E. MAILLOT
Geophysical Department
Phelps Dodge Corp.

BRIEFLY, the application of geophysical methods to geologic ore deposit problems may be divided into three groups:

(1) At operating properties whether underground or surface.
(2) On undeveloped or only partially developed properties or prospects.
(3) In water exploration, which in the southwest represents a major problem and often is of great importance.

Methods employed fall into two classifications.

First, those which measure only natural phenomena; these include magnetic, self-potential, telluric currents and gravity.

The second involves the introduction into the earth of some form of energy the most common of which is electrical currents of varying voltages and frequencies. Under this heading are various forms of the resistivity method, electro magnetic, electric-transient and induced polarization or pulse potential methods. Among the artifically induced energy methods, the seismic method may also be included.

There has probably been more study and development in the last three mentioned electrical methods as applied to mining problems in the past five years than in the preceding quarter century. The ideal in geophysics would be a direct mathematical interpretation of geophysical data without regard to geological conditions. We seriously doubt whether this will become possible in the forseeable future. Certainly in the present stage of development, geology is a requirement for reliable interpretation. Indeed, in the course of exploration it is the geologist or mining engineer who discovers undeveloped areas and recommends further investigation, possibly by geophysical means.

As previously mentioned, in the past five years there have been some noteworthy advances and certainly a much better understanding of the formidable problems involved. However, the science is still very much in its infant stage and now might be compared to the early stages of development of petroleum geophysics, say in the mid 20's. In this regard it might be pointed out that in 1950 the mining industry spent on geophysical surveys and research only 1 to 2 percent of the amount spent by the petroleum industry. This is not quite as bad as it sounds since the oil industry is larger and possesses much greater resources; however, the fact does remain that mining has lagged far behind in financing geophysical research and development.

Advances Slow

In the following paragraphs the three major electrical methods which employ artificial fields will be described. All of these methods are in use and employ various instruments and techniques.

Resistivity methods are probably the most extensively employed. They are all based on variations in the earth resistance, and there are many differences in instrumentation, electrode configuration, field techniques and interpretation.

During the last five years there have been important electrode configuration improvements as well as greatly improved instrumentation, advanced devices for alternating the dc power source, and a comparator hookup between the potential electrodes to eliminate potential differences has been devised. In the course of these developments interpretive depth has been approximately doubled.

There have also been other improve-

ments such as the procedure of taking two series of measurements normal to each other at each station to eliminate or reduce anisotropic effects. A relatively high plane has been reached in instrumentation and procedure for this method. However, accurate interpretation is still weak. The old empirical method at times appears to be superior to direct mathematical approaches. While interpretation by direct mathematical means are now quite unreliable, it is believed that they can be worked out. Work at Phelps Dodge has been on an integral system, and while it is not altogether successful at this time, there has been sufficient encouragement to warrant continuing research in this direction. In developing a strictly mathematical interpretation it would be hoped that the interpretive depth would be increased with the same instruments and techniques now employed.

Induced polarization or pulse methods have taken about as many forms as have the resistivity methods. Basically they involve the measurement of the change in shape and time of decay of an electric current introduced into the ground. Usually this current has a considerably greater voltage than that employed in the resistivity measurements, generally ranging between 1000 and 3000 v. The pulse may be introduced into the ground and decay measured by a variety of electrode configurations as with resistivity. A good deal of research work has been done on this method and in some types of deposits, such as disseminated sulfides, it probably possesses certain advantages over other methods. It is questionable whether or not the present interpretation technique is any more reliable than with other electrical methods. A disadvantage of the method is the large amount of equipment required.

Electro magnetic methods have also taken many forms. They rely on transformer type action to set up induction currents in conducting bodies. The electrical fields of these currents are then measured in regard to the amplitude and phase. Various frequencies are employed, usually between 200 and 800 cycles. The current may be introduced by direct contact, such as with electrodes, or by an energizing loop. Responses can also be measured directly by electrodes or receiving loops. Probably both types of receivers are preferable. As in the induced polarization methods it is possible to measure several physical properties at the same time and from the same data.

Need to Go Deeper

There are two main problems to be solved with the above three methods. While an interpretive depth or resolving power of say 500 ft is often sufficient, there are many cases when it is necessary to go deeper than 1200 ft to reach the top of mineralization.

In regard to depth penetration or resolving power there is, of course, the question of degree of mineralization and its effect on the response recorded at the surface. Each of the methods probably has its advantages in various types of mineralization. In practice the unhomogeneous character of the earth and more especially that of igneous rocks does not as yet lend itself to simple and precise mathematics. As previously stated, in practice a purely mathematical approach at the present time has not been altogether successful. In spite of this it seems possible that eventually there will be developed a mathematical interpretation solution which will give reasonably reliable results and which will also extend interpretation to greater depths.

A second type of artificial energy applied and measured is employed in the seismic method. While it has not been tested extensively on mining problems, results so far have not been encouraging. The main difficulty would appear to be the generally complex character of structure and formation encountered in mining areas. It is evident that a good deal of research would be necessary for this method to have any appreciable application.

Natural Magnetic Fields

In the measurement of natural phenomena the magnetic method is the first, and probably most widely used. This method has been employed for many years in relation to iron deposits, sulfides and gold placers. It involves the measurement of anomalous magnetic fields associated with mineralization. For ground surveys of iron deposits, an instrument such as the dip needle is adequate, but for sulfides or placer deposits an instrument of much greater sensitivity is required, since anomalies as low as 20 or 30 gammas must be distinguished.

Development of the airborne magnetometer has greatly increased the scope of magnetic surveys and has been of great value in outlining areas for ground exploration and for eliminating normal magnetic trends. One magnetometer — preferably two — should be part of the equipment of any mining company going into geophysical exploration.

A second method for measuring natural fields is the Self-Potential. A comparatively sensitive potentiometer is employed and difference in potentials measured between equally spaced points. Oxidization of minerals other than sulfides, as well as other natural phenomena, may also result in the development of potential differences. While the method is rapid and requires a minimum of equipment, it does not, unless the oxide body is close to the surface, delineate its outlines or give any reliable depth data. It is probably the earliest electrical method developed and is still a valuable reconnaissance tool.

A third method in this classification is measurement of telluric current. There is not sufficient information available to accurately assess its possibilities in connection with mining problems. It has been known for many years that a potential difference exists between any two points of the earth's surface, and they are known to occur on a global scale. The method is in a sense a resistivity one, the difference being that the large ground current sheets are measured in place

Measurement of gravitational field underground has proved useful in operating mines

of artificially applied current. It is subject to interference from self-potentials and man-made currents. At the present time telluric currents do not appear widely adaptable to mining problems.

The fourth is the gravity method. Until quite recently this method has had little attention as applied to mining problems. However, Phelps Dodge has found it applicable under certain underground conditions. Its use is greatly simplified when the rock densities are relatively uniform and the mineralized zones have a high density contrast. This company has employed it where rock formations have only quite small contrasts. Average density contrast has been 2.70 for rock and 3.5 to 4.5 for the mineralized zones. As a whole the method will probably not have widespread use on the surface since most mines are located in country of more or less rugged topography. The method thus becomes impractical when it is realized that elevations must be correct within 1.5 ft over several thousand feet and hence would require months of surveying in preparation for a surface survey.

Underground surveys, however, have been successful since topographic effects become less with increasing depth. Topographic corrections therefore decrease and survey data is usually already available. For its purpose Phelps Dodge corrects for topography to a radius of 65,000 ft and employs U. S. topographic maps for computing the correction.

Required calculations are arduous for preparation of terrain correction tables, but once prepared, surveys can be made quite rapidly as the field work does not require an undue expenditure of time. It would appear that this method could have a wider application than at present. The described natural phenomena are the chief ones at present of interest in the mining field.

Stray Currents Interfere

At operating properties there are many difficulties surrounding the use of electrical methods due to extraneous currents entering the ground from dc circuits, and at times from ac circuits. This prohibits, except during shut down periods, the use of resisitivity and pulse potential or induced polarization methods during mine operating periods. It will also eliminate the use of self-potential and magnetic methods. Except possibly for diamond drill hole investigations, the company's experience with electrical methods underground has not been successful. It is for the above reasons that the use of the gravity meter as applied to underground exploration was worked out. Normal mine operations do not in any way affect results, and where employed, results have been moderately successful.

Airborne magnetometer greatly widened field for magnetic surveys

It is impossible to generalize on the range of the gravity meter since this depends entirely upon the mass of the mineralized area and its gravity contrast with the surrounding rocks. Stoping areas, naturally, have a certain effect but these can usually be taken into account and corrected.

The same disturbing influences that affect underground electrical geophysics exist on the surface of operating mines and these effects may well extend for several thousand feet. In addition to this there usually are pipe lines, rails, etc., which could influence magnetic and electrical measurements.

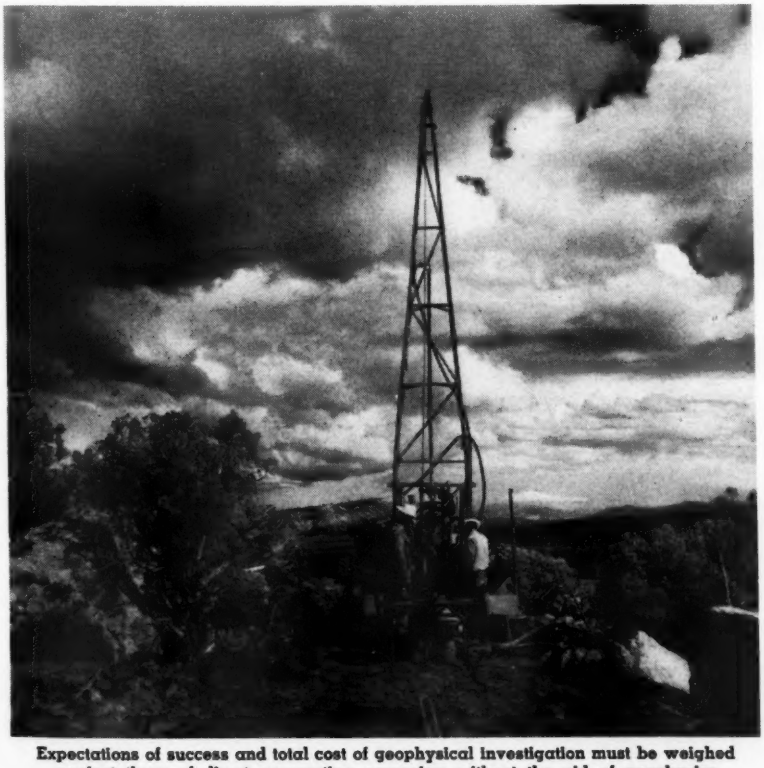
If even a small amount of magnetite is associated with ore, a reconnaissance magnetic survey will definitely be called for. The main usefulness of a magnetic survey is to eliminate barren areas in order that the slower, detailed electrical work may be concentrated.

Should Justify Cost

It should be understood that before a geophysical survey is undertaken there must be some definite expectation of success to justify the cost. Geological factors must be weighed, possible depth to mineralization estimated, and the total considered in respect to the cost of a direct prospecting campaign such as diamond drilling without the aid of geophysics. On operating properties there are usually sufficient data to reach an intelligent decision in these respects.

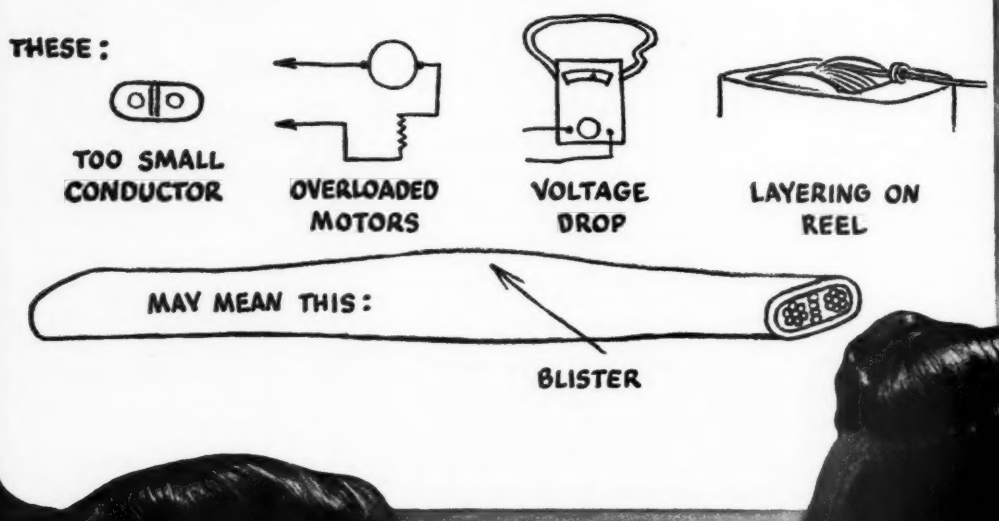
At undeveloped or only partially developed properties or prospects, geophysics probably has its greatest usefulness and the choice of method is seldom limited by extraneous currents and other interfering conditions.

(Continued on page 60)



Expectations of success and total cost of geophysical investigation must be weighed against those of direct prospecting campaign without the aid of geophysics

HOW TO SPOT DAMAGE FROM CURRENT OVERLOAD . . .



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Blisters, formed by gases from overheated insulation, are a sure sign of cable overloading. A torn cable may result. Since you can't always control overloads, it's important to choose *quality* cable.

Today, due to better design, jackets and insulation, good cables shouldn't cook on the reel the way they used to. But this only makes overloads harder to detect. They still may be present . . . caused by too small a conductor, overloaded machines, voltage drop or even layering of the cable. With 4 layers on the reel, according to I.P.C.E.A., unventilated bottom layers lose 65% of capacity.

WHY THE NEW ANACONDA CABLES ARE SAFER

First, they are more flame-resistant. Jacket is made from a new neoprene formula. Improved cold-rubber insulation gives greater heat stamina. Patented breaker strip* insures a safer ground. No ANACONDA Cable has ever failed a U. S. Bureau of Mines flame-test!

CABLE LIFE NOW MUCH LONGER

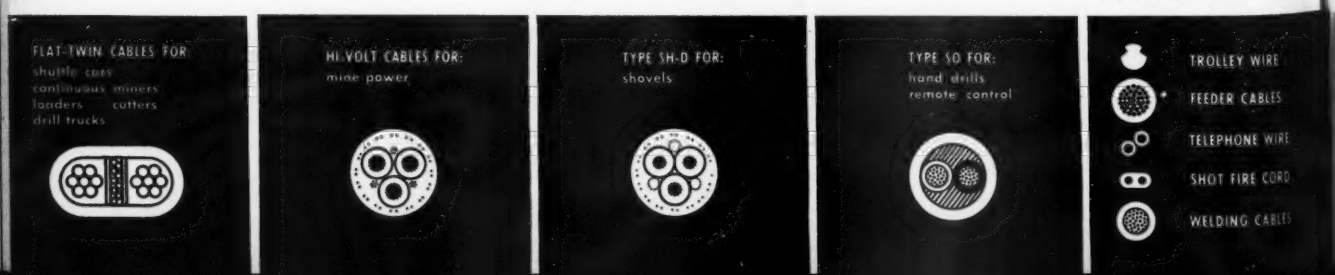
In 15 mines recently surveyed, ANACONDA Cables on shuttle cars are lasting up to 300% longer than cables made only a few years ago. Together, jacket and insulation protect these cables better—especially in wet mines where sliver-cuts can cause shocks. The cables are tougher. New-type stranding flexes better under tension.

All this means economy because *one* break in cheap cable costs more than you can save by buying on price. For a sample of this new cable, call your Anaconda Sales Office or Distributor. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.* 53302

ANACONDA®

TODAY'S HEADQUARTERS FOR MINE CABLE

*U. S. Patent No. 2,455,773



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The concave shape stays sharp as it wears away. That means:

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PATENT NUMBER
2,217,347

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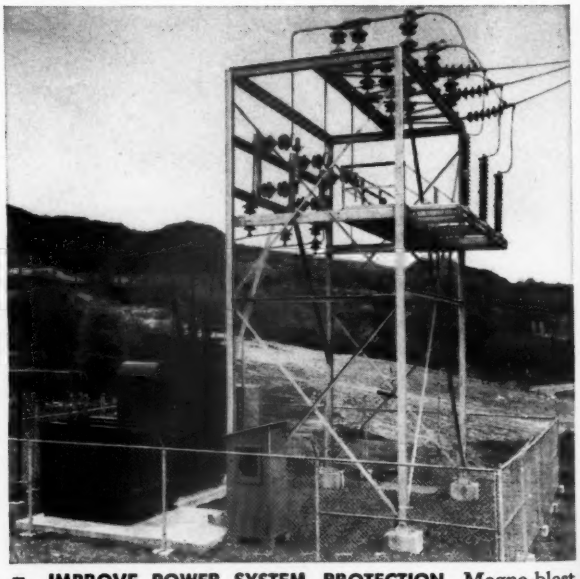

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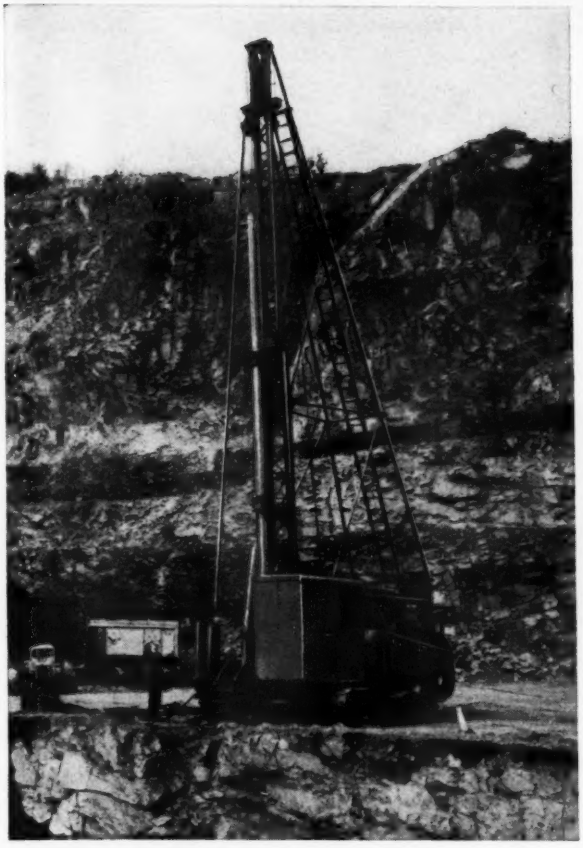

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G-E engineered electrical systems mean faster open pit mining at less cost

You need speed, flexibility, and safety in your open pit mining operations if you are to meet present demands for higher production per man-day. ***Modern electric power*** is the key. Here's what it helps you to do.

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These production-boosting techniques can be applied to your surface mining operation. A G-E mining industry specialist can show you how. Contact him at your nearest G-E Apparatus Sales Office. General Electric Company, Schenectady 5, New York.

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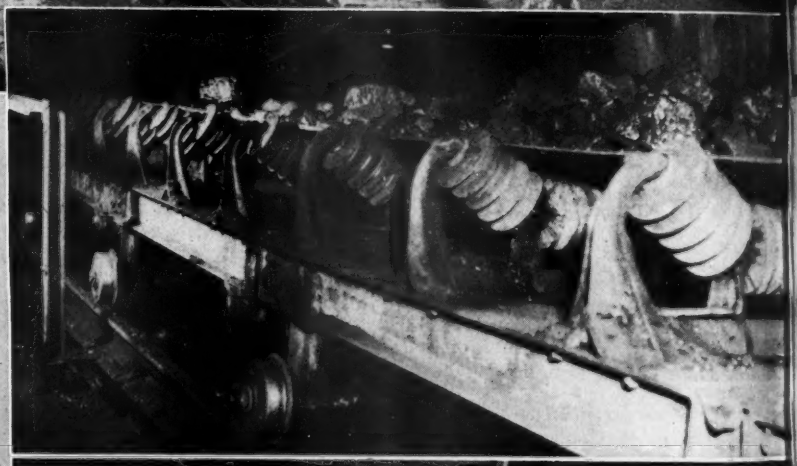

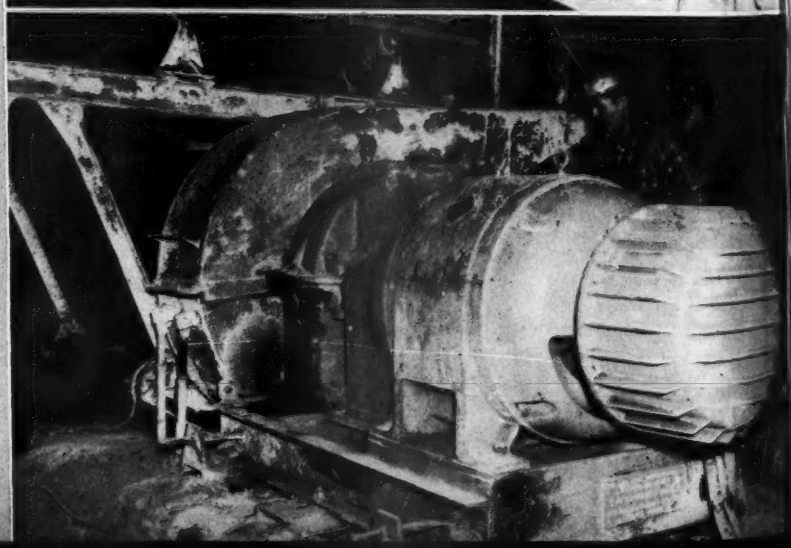

FACTS and FIGURES ON THIS ALL-BELT JOB

36" panel belts carry the coal from working areas and deposit it on 42" sub-main haulage belts running from either side (five each way) to a 48" main haulage belt for delivery to a storage hopper. The 42" belts are projected to 9000' from the main belt, with a drive unit every 4000'. Coal flows at 500 fpm on the 42" belt, and at 600 fpm on the 48" belt.

All 42" and 48" conveyors are of Joy knockdown type, with heavy duty idlers, drives and take-ups, and with impact idlers where required to absorb shock of large lump transfer. A 48" transfer belt, with Joy impact idlers throughout, takes the discharge from each 42" belt, reducing wear and impact damage on the 48" main belt. A unique 60" Joy shuttle feeder belt serves the storage hopper, and a 48" feeder takes the coal from the hopper to a 48" steel cable slope belt for delivery out of the mine.

Although rated at 1000 TPH on this job, installed in a highly modern mid-western operation, a Merrick weightometer has shown up to 2400 TPH going over the 48" belts.

Anything from a single belt to an all-belt conveying system like the job illustrated at left

...Let Joy Engineer it

SPECIAL FEATURES GIVE YOU EXTRA ADVANTAGES

The Joy line includes a complete selection of belt conveyors to meet any underground operating condition for gathering, main line or slope haulage—and any requirement above ground as well. They're built in any required width from 26″ to 48″, and in a wide range of styles and sizes. All Joy Belt Conveyors feature refinements of design and materials which insure rugged, heavy-duty construction, and provide field-proven dependability and low maintenance.

KNOCKDOWN DESIGN MAKES ADVANCING FAST AND EASY

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Joy "knockdown-type" conveyor sections are highly appealing features to most operators. They provide the easy portability so essential in low coal, and in any seam, they greatly reduce the labor and down-time losses of conveyor advances or change-overs.

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Investigate the benefits of Joy Heavy Duty Idlers on your belt haulage jobs. And remember, Joy is the only manufacturer of both tandem-pulley conveyor drives and direct-connected, totally-enclosed single pulley drives. We have the experience and the equipment to answer your conveyor problems *best* . . . let us help you.

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Both Wanted Safe, Fast Haulage

(AND THEY GOT IT!)

Here are scenes at two mines with different problems, but with several things in common. Both are bituminous mines, and both wanted haulage systems that would be safe, fast, and capable of handling big daily tonnages.

In each case, Bethlehem track engineers made exhaustive studies, then designed layouts to meet the specific needs involved. In each case, too, the track was prefabricated at Bethlehem's shops—rails cut and curved, holes drilled, etc.—so that all components could be quickly installed. The mines got the track they were looking for. Safe, smooth, high-speed track complete with turnouts, switch stands, guard rails, braces, joint bars, and all other accessories, even the bolts and nuts. One was a surface job, one below ground—but both made it possible to speed the flow of traffic, avoid costly haulage snarls, and simplify the installation work.

Bethlehem engineers, and Bethlehem prefabricated track, can do the same for you. Call or write us for details.

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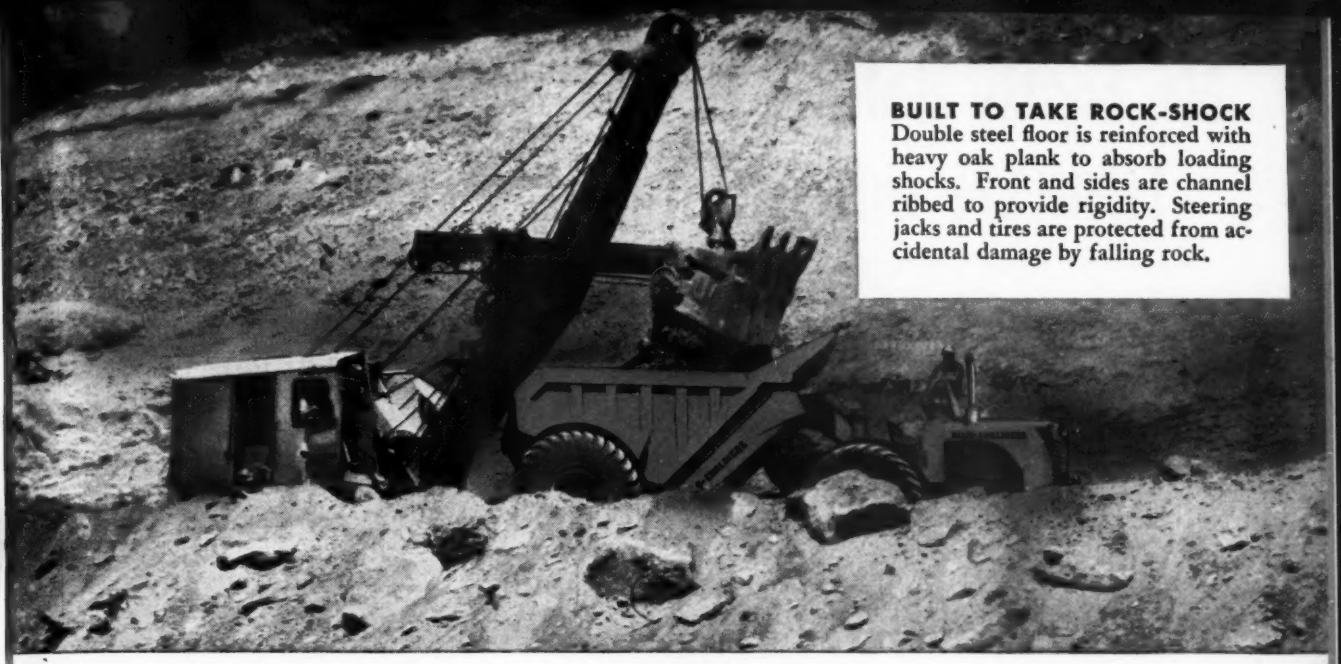
BETHLEHEM PREFABRICATED TRACK

BETHLEHEM STEEL



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Double steel floor is reinforced with heavy oak plank to absorb loading shocks. Front and sides are channel ribbed to provide rigidity. Steering jacks and tires are protected from accidental damage by falling rock.

Allis-Chalmers Motor Wagon

built to meet today's high production demands

DUMPS SAFELY . . . CLEANLY — Wheel base remains constant during entire dumping cycle. With this stable wheel base, operator may back to the very edge of a steep fill, set the powerful air brakes on *all four* wheels and put the entire load over the edge.

Clean interior, plus high, 70-degree tilt assures complete load ejection. Body may be heated by exhaust to prevent freezing of materials in severe temperatures.

MULTIPLY TRACTOR USE WITH INTERCHANGEABLE SCRAPER BODY . . . for stripping and other self-loading operations. TS-200 Motor Scraper is a high-speed, rubber-tired unit with 13-yard capacity, "through-the-center" boiling action for easy loading, positive forced ejection and many other high-production features.

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Choice of Engines—165 hp. Cummins; 176 hp. Buda.
Capacity — 15 cu. yd., heaped; 18 tons.
Speeds — Five forward to 21.6 mph.; reverse to 2.5 mph.
Hydraulic steering and dumping.

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TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

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Dozens of different Timken® rock bits fit the same drill steel!

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It takes just a minute to unscrew one type of Timken bit and screw another different bit on the same drill steel—right on the job! No time wasted going after another set of drill steels.

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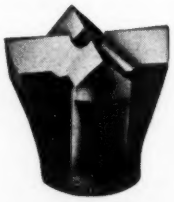
Both Timken multi-use and carbide insert bits give you two important advantages: 1) made from electric furnace Timken alloy steel, 2) special shoulder union that keeps drilling impact from damaging threads.

Our rock bit engineers will be glad to help you with your drilling problems. They're experts in cutting drilling costs. There's no obligation. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".



WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for ordinary ground. With correct and controlled reconditioning, they give lowest costs per foot of hole when full increments of steel can be drilled.

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Give highest speed through hard, abrasive ground. Also most economical for constant-gage holes, small-diameter holes, very deep holes.

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An Analysis of Public Law 552*

First Year's Operation of the Federal Coal Mine Safety Act Has Revealed Several Weak Points and Some Strong Ones

By M. J. ANKENY

Safety Director
Bituminous Coal Operators' Association

PUBLIC Law 552, known as the Federal Coal Mine Safety Act, is the first permanent venture of the Federal Government into the field of compulsory coal mine safety regulations. By amending the Act of May 7, 1941, under which the Coal Mine Inspection Service of the Bureau of Mines previously operated, Public Law 552 established certain measures designed for, and limited in scope to, the prevention of major disasters in mines. The Act, in effect was a compromise between the proponents of the bill introduced in the 82nd Congress by Senator Neely, who believed that the Federal Government should be given the power to make and enforce regulations governing all phases of coal mine safety, and those who believed that the power of making and enforcing mine safety regulations was the sole responsibility of the several States. It is my opinion that the most effective argument used against the idea of granting unlimited regulatory powers to the Federal Government was the prediction from many sources that the granting of this power would ultimately result in the drying up of appropriations, and therefore the destruction of State agencies established for these purposes.

Since less than 10 percent of the fatalities result from coal mine accidents of disaster proportions, Public Law 552 leaves a wide field for the operation of State inspection agencies. If the States can maintain the downward trend of non-disaster accidents that has been taking place during the past several years, and in cooperation with the Federal Bureau of Mines can eliminate the major disasters, I believe that there will be no further encroachment on the prerogatives of the States to regulate the safety of the mines.

The Law

In brief, the Federal Coal Mine Safety Act, Public Law 552, amended the Act of May 7, 1941, by adding to it a new title, "Title II—Prevention of Major Disasters in Mines," and by assigning to the original Act a title as follows: "Title I—Advisory Powers Relating to Health and Safety Conditions in Mines." Thus, the Bureau of Mines retains its former duty of inspecting mines and making recommendations covering non-disaster hazards on an advisory basis and in addition is given the responsibility of enforcing regulations prescribed by law and designed to prevent major disasters in mines. It is well to remember, therefore, that in the cases of non-disaster hazards the Federal Inspectors act only in an advisory capacity, but in cases of disaster hazards they have law enforcement powers.

Title II of the Act authorizes mine inspections to be made at least annually to determine the existence of imminent danger and violations of the mine safety provisions; provides a voluntary State Cooperative Plan in States desiring to enter into a cooperative agreement with the Bureau of Mines; establishes operational procedure for the making of findings and orders by Federal Coal Mine Inspectors; establishes procedure for giving notices of such findings and orders; provides for the creation of a Federal Coal Mine Safety Board of Review for the adjudication of appeals from orders issued by the Bureau of Mines; provides for the review of orders by the Director of the Bureau of Mines and the Federal Coal Mine Safety Board of Review; establishes specific regulations known as "Mine Safety Provisions" for the prevention of disasters; provides a penalty for non-compliance with orders issued under the Act, and exempts from Title II of the Act all mines in which no more than 14 individuals are regularly employed underground.

Inspectors Use Two Standards

Since the Act was adopted on July 16, 1952, when a Federal Coal Mine Inspector inspects a mine, he uses two sets of standards, one set, known as the Federal Mine Safety Code, for so-called non-disaster hazards, and the other set known as Section 209 of Title II of the Federal Coal Mine Safety Act for so-called disaster hazards. With respect to the non-

Present Act requires pre-shift inspection on idle days of only those areas where men are going to work

* Based on a paper presented to the West Virginia Coal Mining Institute in Fairmont, W. Va., June 5, 1953.

disaster hazards, the inspector acts entirely in an advisory capacity, and has no authority whatever to enforce his recommendations. If a mine is a party to a wage contract which incorporates the Federal Mine Safety Code, any outside enforcement authority that may exist rests solely on the union with which the mine has a contract. With respect to disaster hazards, the Federal Inspector has the responsibility to determine the existence of "imminent danger," and the existence of violations of Section 209 of Title II of the Act and to take appropriate action under the Act.

Section 203 (a) (1) of the Act states that "If a duly authorized representative of the Bureau (meaning an inspector), upon making an inspection of a mine . . . finds danger that a mine explosion, mine fire, mine inundation, or man-trip or man-hoist accident will occur in such mine immediately or before the imminence of such danger can be eliminated, he shall also find the extent of the area of such mine throughout which such danger exists. Thereupon he shall immediately make an order requiring the operator of such mine to cause all persons . . . (except persons necessary to remove the danger) . . . to be withdrawn from, and to be debarred from entering, such area . . . ." This peculiar legal phraseology is construed to mean that whenever the inspector finds imminent danger of a mine disaster he shall immediately issue an order to withdraw the men from the area of danger. It is interesting to note that the type of accident for which the imminent danger must exist is specified, therefore an inspector cannot issue an order to withdraw men in the case of an impending roof fall accident, for example, unless there is a possibility of a man-trip being involved. From July 16, 1952, when the Act went into effect, to July 16, 1953, a period of one year, during which time 3056 regular inspections were made, under the act, 11 orders to withdraw men because of the alleged presence of imminent danger were issued at only nine mines. The conditions which brought about the issuance of withdrawal orders under Section 203 (a) (1) of the Act are as follows:

TABLE I

State	Number of Orders	Number of Mines Affected
Virginia	4	3
Pennsylvania Anthracite	2	1
Pennsylvania Bituminous	1	1
West Virginia	1	1
Kentucky	1	1
Illinois	1	1
Alaska	1	1
Total	11	9

TABLE II

Section	Condition	Number of Orders
209(c)	Inadequate roof support along roadways	9
209(d)(1)	Inadequate quantity of air	9
209(d)(6)	Ventilating active face areas with air that had passed through abandoned workings	4
209(d)(8)	Preshift examinations not made	5
209(d)(9)	Incomplete daily examinations for gas	2
209(d)(9)	Foreman not certified under laws of State	2
209(e)(1)	Dangerous accumulations of loose coal or coal dust	21
209(e)(3)	No rock dusting in mine or in certain areas	13
209(e)(4)	Incomplete rock dusting (certain areas not rockdusted)	6
209(e)(5)	Low incombustible content of dust	16
209(f)(1)	Non-maintenance of permissible equipment	1
209(f)(4)	Bare power wires too close to pillar workings	1
209(g)(1)	Inadequate fire protection	5
209(h)(2)	No boreholes when driving toward impounded water	1
209(h)(5)	Use of black blasting powder	3
	Total	98

TABLE III

State	Number of Orders	Number of Mines Affected
Kentucky	45	19
Virginia	20	9
West Virginia	17	6
Pennsylvania	7	4
Iowa	5	3
Tennessee	2	1
Illinois	1	1
Indiana	1	1
Total	98	44

Dangerous roof along roadways..... 4
Dangerous accumulations of gas..... 2
Excessive methane in air current.... 1
Dry and dusty conditions—no rock dust applied 1
Gasoline from surface entering mine. 1
Impounded water above mine workings 1
Black damp from old works entering mine 1

The distribution of withdrawal orders issued because of the alleged presence of imminent danger, by States, is shown in Table I.

Dangers Not Imminent

Section 203(b) of the Act states that "If such representative of the Bureau finds that any provision of Section 209 is being violated and that the conditions created by such violation do *not* cause danger that a mine explosion, mine fire, mine inundation, or man-trip or man-hoist accident will occur in such mine immediately or before the imminence of such danger can be eliminated, he shall find what would be a reasonable period of time within which such violation should be totally abated . . . ." In other words, if a violation of one of the mine safety provisions is found and such violation does not constitute "imminent" danger, the inspector must determine what would be a reasonable time for abatement, and the Act provides further that he shall notify the operator of his finding. At the expiration of the reasonable time so found, an inspector will return to the mine and re-inspect the condition. If he finds that the alleged violation has not been abated, he may then issue an order to withdraw the men. He may, however, at his own discretion, issue a finding extending the time originally fixed. During the first year that the Act was in effect, 98 orders to withdraw men because of alleged violations of the mine safety provisions were issued at 44 mines. The conditions which brought about the issuance of withdrawal orders under Section 203(c) (1) of the Act are shown in Table II.

The distribution of withdrawal orders issued because of failure to abate alleged violations of Section 209, by States, is shown in Table III.

Two Kinds of Notices

It is important to observe that there are two distinct kinds of notices that the inspector may issue and post at a mine. One is a Notice of Findings and the other is a Notice of an Order. When an inspector finds that a violation of Section 209 exists and sets a reasonable time for compliance, he does not issue an order, he merely issues a Notice of Findings. When he returns to the mine and finds that the violation of Section 209 has not been abated, he issues a Notice of an Order to withdraw the men. The foregoing fact is of great importance

because under the law, an operator cannot appeal to the Director of the Bureau of Mines or to the Federal Coal Mine Safety Board of Review upon the mere issuance of a Notice of Findings. It is only upon receipt of a Notice of an Order that an operator can appeal to the Director or the Board.

The mine safety provisions of Section 209 of the Act contain certain requirements that are applicable only to gassy mines; therefore, it is necessary that the Bureau classify mines as gassy or nongassy. If a mine, immediately prior to the effective date of Title II of the Act was classified as or found to be a gassy or gaseous mine in accordance with the laws of the State in which it is located, or if it was operated as a gassy mine prior to this date, the Bureau treats it as a gassy mine without further classification and applies the provisions of Section 209 applicable to gassy mines. A mine that has not been classified gassy by the State or that has not been operated as a gassy mine is treated as a nongassy mine by the Bureau unless an inspector upon making an inspection of the mine finds that methane has been ignited in such mine or finds methane by use of a permissible flame safety lamp or by air analysis in an amount of 0.25 percent or more in any open workings when tested at a point not less than 12 in. from the roof, face, or rib. In this event the inspector must make an order requiring the operator to comply with the provisions of Section 209 pertaining to gassy mines. Once such an order is issued the mine remains forever a gassy mine unless such order is annulled by the Director or the Board. It is important to know that application for such annulment must be made not later than 20 days after receipt of notice of such order. It is also interesting to note that the order requiring the operator to comply with the provisions of Section 209 pertaining to gassy mines is issued even if the mine is in compliance with such provisions at the time the order is issued. During the first year under the Act, gassy classification orders have been issued at 49 mines.

Penalties are not provided in the Act for an operator who violates the mine safety provisions. However, any operator notified of an order requiring him to withdraw men from a mine and to debar men from entering a mine, who willfully violates or fails to comply with such order is subject to a fine of not more than $2,000. Any agent of an operator is subject to the same penalty and any individual, knowing of such an order, who enters the area in question, unless he is a person who is lawfully authorized to enter, is likewise subject to the same penalty.

Reopening Closed Mines

How does an operator proceed to get his mine or area within a mine reopened after men have been withdrawn by order of a Federal Inspector? To answer this question fully, two different sets of conditions must be assumed as follows:

(1) The operator acknowledges the existence of "imminent danger" or a violation of the mine safety provisions and forthwith abates the "imminent danger" or violation.

(2) The operator denies the existence of "imminent danger" or of a violation of the mine safety provisions. The operator may believe that the inspector has erred in judgment, has misinterpreted the specific provision, or has acted arbitrarily or capriciously. In either case, the operator may apply to the Director of the Bureau for a review or to the Federal Coal Mine Safety Board of Review. If he applies to the Director and his appeal is denied, he still has recourse to the Board. If his application is denied by the Board, he has further recourse for judicial review by the United States Court of Appeals for the circuit in which the mine is located. Meanwhile, his mine or the affected area of the mine is shut down.

In the event that the operator acknowledges the existence of "imminent danger" or a violation of the mine safety provisions, and after having withdrawn the men, promptly corrects the condition, he immediately applies to the Director for review. This application may be made by telephone or telegraph but should be supported by an application on a form which will be provided by the inspector. The Director will immediately send three authorized representatives (inspectors) to the mine other than the inspector who issued the order. They will inspect the condition and if they find that the "imminent danger" for violation has been abated, they will immediately notify the Director and he will, without delay, issue an order annulling the order under review. If the inspectors find that the "imminent danger" or violation has not been abated or has only been partially abated, they will so notify the Director and he will issue an order denying the application or revising the order under review as the case may be. The operator may apply direct to the Board without recourse to the Director, but this procedure is not recommended in cases of this kind because of the delay in getting the mine reopened that would result. If the operator is in disagreement with the findings of the Director, he may then submit his appeal to the Board for further review. The main thing to remember in cases of this kind is to be sure that the "imminent danger"

Ventilation required under the law follows established practice in well-managed mines

or violation has been abated before submitting an appeal. It should appear obvious from the foregoing that if there is no question about the existence of "imminent danger" or the existence of a violation of the mine safety provisions, it would be better to proceed to correct the condition before an order is issued, a procedure that is being followed generally throughout the industry.

If the case is one in which the operator denies the existence of "imminent danger," doubting the judgment of the inspector, there is little that can be done except to withdraw the men and have the issue settled through the system of appeals established by the Act.

If the case is one in which the operator believes that the inspector has misinterpreted the meaning of the mine safety provisions or has acted arbitrarily or capriciously in issuing a finding of a violation, he may appeal informally to the inspector's immediate supervisor or to the Director. If he can show that there has been an outright misinterpretation of the Act or that the inspector acted arbitrarily, it is entirely possible that the Director would require the inspector to withdraw the finding. If this procedure fails, the only recourse would be to let the time specified in the finding expire without taking any action and after the Notice of an Order to withdraw the men is issued to appeal directly to the Board after having complied with the Withdrawal Order. BCOA has recognized the inequity of this procedure and has asked the Director to change it to the extent that when an inspector issues a Withdrawal Order because of an alleged violation of the mine safety provisions, that a delayed time of compliance be stated on the order so as to give the operator an opportunity to apply to the Board for review before the men are withdrawn from the mine. It is felt that this could be done within the present wording of the Act, but if the Director decides that it cannot be done, an effort should be made to have the Act revised in this respect.

State Cooperative Plan

The foregoing discussion has been without regard to the existence of a State Cooperative Plan as provided for in the Act. Section 202(b) of the Act provides that in order to promote sound and effective coordination in Federal and State activities within the field covered by Title II, the Director shall cooperate with the official mine inspection or safety agencies of the several States. It is further provided that any State desiring to cooperate in making the inspections required may submit through its official mine inspection or safety agency a State Plan for carrying out the purposes of the Act. So far, five States, Washington, Wyoming, North Dakota, Oklahoma and North Carolina, have entered into cooperative agreements with the Bureau of Mines. Without going into details as to the specific operational procedure required under a State Plan, I would assert without reservation that any operator or any State inspection agency would be most ill-advised to enter into a cooperative agreement as provided for in the Act. It is my candid opinion that there is a wide-open field for cooperative effort between State and Federal inspection agencies without having this effort formalized under a highly complicated contract which would reduce the effectiveness of both agencies and would deprive operators of the right to appeal to the Director of the Bureau of Mines from Withdrawal Orders issued by Federal Inspectors. There appears to be no indication at the present time that any of the major coal-producing States will enter into any cooperative agreements involving State Plans as provided for in the Act.

Ventilation Provisions

The philosophy behind the ventilation requirements contained in the mine safety provisions of the Act is based on the premise that when the methane content of the air in a working place or in a split return reaches a quantity of one percent the condition is becoming dangerous and requires immediate attention. There is nothing new about this idea; as a matter of fact, it has long been the practice in well-managed mines to assume that whenever methane is present in such quantities that it can be detected with a flame safety lamp, that prompt action be taken to reduce the methane content. One percent is used as a standard because it is generally regarded to be the least amount of methane that can be detected with a flame safety lamp in the hands of a competent observer. Whenever the air in a split return reaches a quantity of 1.5 percent it is presumed that the situation is out of control and a state of imminent danger exists. Federal Inspectors are authorized specifically by law to order the withdrawal of men from a mine or affected portion of a mine immediately upon the finding of such a condition; however, the problem of maintaining split returns below 1.5 percent in certain extremely gassy mines is recognized and in these mines a maximum of two percent is provided before the men have to be withdrawn.

Regardless of whether or not a mine is liberating methane, the law requires that the quantity of air reaching the last crosscut in any pair or set of entries shall be not less than 6000 cfm. If methane is being liberated in such quantity that the split returns are not kept below one percent of methane the inspector can require that more than 6000 cfm be circulated through the last crosscuts. It is my opinion that these requirements are not unreasonable and that they will be helpful in eliminating disaster hazards from coal mines.

Section 209(d) (5) of the Act provides that in a gassy mine, air which has passed by an opening of any unsealed abandoned area shall not be used to ventilate any active face area in such mine if such air contain 0.25 percent of methane. It is well to keep in mind that the inspector must have positive evidence that the air contains 0.25 percent or more of methane before he can issue a finding. In any event, he must allow sufficient time to correct the condition before issuing a Withdrawal Order unless the air contains more than one percent of methane in which case he is required to issue a Withdrawal Order immediately. The law provides, however, that a partially worked-out panel shall not be considered to be an abandoned area unless the entire panel is abandoned.

Section 209(d) (6) contains the provision that is giving some operators the greatest concern at the moment. This section provides that in a gassy mine, air that has passed through an abandoned panel which is inaccessible for inspection, or air that has passed through a similar abandoned area which is inaccessible for inspection, or air which has been used to ventilate a pillar line, or air which has been used to ventilate an area from which pillars have been removed, shall not be used to ventilate any active face area in such mine. The Bureau has taken the position that this paragraph prohibits the ventilating of solid rooms, turned from a room or panel entry, with air that has been used to ventilate a pillar line in the same entry. This interpretation is, of course, unreasonable and unjustified when applied to certain conditions in mines and unless it is set aside by some higher authority will result in drastic changes in many well-established mining and ventilating systems.

The fire bossing provisions of the Act are an improvement over the requirements of the Federal Mine Safety Code in that when maintenance men and pumpers go underground on idle days the entire mine need not be examined; however, the areas in which men are going to work on idle days must be given a pre-shift examination within 12 hours immediately preceding their entrance into such areas.

Rock Dust Requirements

Some difficulty is being experienced with Section 209(e) (4) which states, "In mines partially rock-dusted or

in mines that are required to start rock-dusting, haulageways and parallel entries connected thereto by open crosscuts shall be rock-dusted. Back entries shall be rock-dusted for at least 1000 ft outby the junction with the first active entry. Inby this junction, the rooms, entries, and crosscuts shall be rock-dusted." This paragraph of the Act is sorely in need of revision because nobody knows exactly what it means. Some inspectors assume that it requires all back entries that have previously been rock-dusted to be re-dusted if the incombustible content falls below 65 percent, but if rock dust has never been applied to these back entries they need not now be rock-dusted. The Bureau of Mines has taken this problem under

Interpretation of provision of Act regarding application and sampling of rock dust has raised serious problems

advisement, and it is expected that a reasonable solution will eventually be reached.

The law further requires that where rock dust is applied, it shall be distributed upon the top, floor, and sides of all open places and maintained in such quantity that the incombustible content of the combined coal dust, rock dust and other dust will not be less than 65 percent. It has been a practice of long standing in the Bureau of Mines to collect rib and roof samples separate from road samples at any given location. Very often the rib and roof sample contains a high percentage of incombustible matter while the road sample is barely under the required 65 percent. A composite sample at this location or an average taken of the rib and roof and the road sample would contain well over the required 65 percent, incombustible matter yet mines have been cited in violation of the law because of the slightly deficient road sample. Citations of this kind are obviously unjustified, and the Bureau has been making a study of the technicalities involved in this problem. It is understood that as a result of recent tests, future procedure will be to collect composite peripheral samples at each location rather than separate rib and roof and road samples.

No ventilation system is proof against possible accumulation of methane in the active working sections of gassy mines. In recognition of this fact, it is believed that as a second line of defense against gas explosions, all sources of arcs and sparks should be excluded from face areas and from return air. The act recognizes that this is an ideal concept but it also recognizes that because of the heavy investment that the industry has in open-type nonpermissible electrical equipment, it would be too great an impact to suddenly require that all such face equipment be of the permissible type. The law therefore provides a system of attrition whereby new equipment purchased for use in gassy mines shall be of the permissible type but open-type equipment now in use in such mines may continue to be used. It appears that the provision, as written, will not create an undue hardship and in the long run will result in the replacement of all open-type equipment with permissible equipment in gassy mines. In the meantime, extra vigilance must be maintained in those mines that are liberating gas in which open-type equipment is being used.

Some Orders Needless

Administration of the Act with respect to personnel matters, efficiency of operation and economy is perhaps outstanding among Government agencies, but the Bureau has been slow in developing firm policy with respect to a reasonable and uniform interpretation and application of the law. While the mine safety provisions of the Act are generally clear and concise, some provisions often prove to be incongruous with the wide variation of conditions encountered in the mines and some do not coincide with the time-honored policy of the Bureau with respect to permissible equipment. There is, moreover, a strong tendency on the part of the Bureau to apply unreasonable interpretations to some of the more obscure provisions of the Act and to adhere strongly to these interpretations without giving much consideration to the practicalities and economics involved. The result is that the operator is frequently forced to make costly though needless changes in operating practices or methods for which he can anticipate no return either in safety or efficiency.

Another disturbing feature of the administration of the Act is that the Bureau has refrained from keeping the industry advised as to its policy concerning the application of the more indefinite or questionable provisions. Decisions have been made by the Bureau on a wide variety of questions submitted by Federal Inspectors pertaining to the application of certain provisions of the Act, and these decisions have been forwarded to the inspectors for their guidance as to Bureau policy. But the Bureau has not publicized these decisions, consequently the operator has no way of knowing what is expected until he is confronted with a finding that he is in violation of the Act. This procedure has resulted in the reporting of a large number of violations by Federal Inspectors that would have been abated before the inspections were made if the operators had been informed as to Bureau policy in advance of the inspections.

It is not intended to imply here that progress is not being made toward the solution of some of the more difficult problems that arise in connection with the administration of the Act. The Bureau has been trying to find a way to allow for mechanical alterations of permissible electrical equipment and to allow for the underground testing and development of new equipment without running counter to the requirements of the Act. Progress is also being made toward the adoption of a more equitable and scientifically correct method of collecting and reporting dust samples so that in the future operators will not be unjustifiably cited for violations with respect to low incombustible content. The industry expects that some of these difficulties will be adjusted in time and that the operation of the Act will proceed with equity and justice.

European Developments In Firedamp Control

Extraction by Pipeline Aids Safety, Yields Fuel

By D. W. GILLINGS

Head, Carbonization Dept., National Coal Board, Central Research Establishment, Stoke Orchard, Cheltenham, England

DURING the past three years there have been important extensions of the technique of direct extraction of methane from coal mines. The operations have developed to become a well-established practice of mining in a number of European coal fields. The essential feature of such operations is the installation of a gas collecting system starting at or near the sources of firedamp in the coal measures and running, mainly by pipelines, direct to the surface. Firedamp is thus diverted from the airways and the explosion danger from methane is considerably reduced.

In most installations boreholes are made from roadways in the mine to collect firedamp from strata near the coal faces. However, there are a number of examples where headings have been driven expressly for accumulation of firedamp which is then extracted by pipelines.

Improvement of safety in mining operations has been the prime objective in these developments and will always be a factor of first importance. At the same time, almost all installations have delivered the methane for some type of exploitation, so far, always as fuel, and in the past two years the rapid expansion of firedamp drainage in Belgium has been dictated, in part, by specially favorable conditions for use of the gas.

The existence of definite sources of methane in coal measures has long been appreciated. Indeed, very early records exist of successful attempts to obtain firedamp directly. These describe experiments in Cumberland (Great Britain) in 1746. Gas obtained from pockets struck during shaft-sinking and in mining operations was actually used in a laboratory for heating.

Methane drainage on the European continent began with preparatory work at the extension of Mansfeld Colliery near Bochum (Ruhr) under wartime conditions in 1941-43. Fig. 1 shows a projected view of a district at the boundary of the Mansfeld mine, which is being mined by longwall-advancing methods. In order to extend to unworked coal, work began in the staple pits and a pilot hole was bored upwards as shown at B0. This was found to emit a large quantity of firedamp under a positive pressure, not readily sealed off. In order to avoid contamination of the airways the gas was led by pipe-lines to the main return airway for dilution and ultimate escape. It was then found that the methane content of ventilating air from faces near the borehole was considerably reduced, and it was soon learned that the controlled extraction of the gas reduced the methane in return airways to an extent sufficient to increase production rates.

A further number of similar boreholes were then drilled upward from the airways in the course of developing individual new coal faces. These were found to yield gas and were connected to the pipe line by which the rich gas was finally led from the pit. It was found advantageous to subject the line to suction obtained from mechanical exhausters (on the surface).

This installation has become the pattern for many later developments, and most of phenomena observed at other sites were encountered during the original work at Mansfeld.

Two Drainage Methods

A number of methods have been proposed and practiced for extraction of firedamp. Of these, the scheme for drilling holes vertically or near-vertically into the strata at the return airway has been widely applied in longwall practice and found most valuable. The most important of the other methods is the use of headings or roadways in coal seams mainly above existing workings. These headings may be specially driven for the work or may be adapted from other mining operations. They are sealed from the rest of the air system, and firedamp accumulating in them is extracted by a pipe line under suction. These two main methods of firedamp drainage have been termed "cross-measure borehole" and "superjacent heading" methods respectively. The cross-measure borehole method is well exemplified by Fig. 1. Fig. 2 shows a general layout in section of superjacent headings.

The most important stage in the cross-measure borehole method is the rapid and systematic boring of the holes in a sequence governed by the rate of advance of the coal face. If a borehole be directed upwards at a tailgate* and reaches the source of firedamp before the face advances,

* The inby end of the return airway in longwall mining.

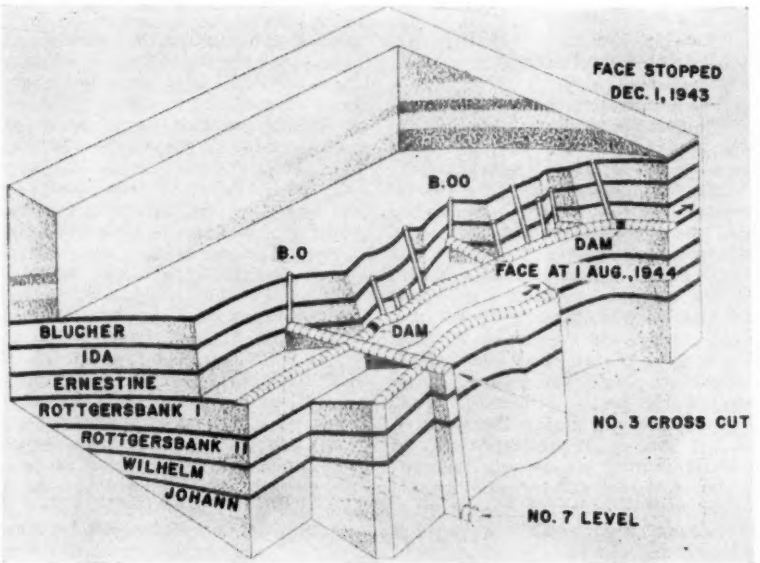


Fig. 1—Methane recovery method at Mansfield Colliery in the Ruhr

the flow of gas will be less than the maximum. This will usually be attained after the face has advanced about 50 yd or more. To maintain the optimum yield of gas, it is vital to avoid delays in drilling.

Just as it is important to bore the holes rapidly, it is essential to extend and couple the pipe lines without delay. The first 15 to 30 ft of each borehole is therefore of larger diameter than the rest of the length, usually 4½ in. and 2½ in. respectively. As soon as the larger diameter is bored, a standpipe is inserted, complete with gate valve, grouted into position and the boring continued through the cemented standpipe until gas flow reaches its peak. The borehole is then coupled to the pipe line by flexible hose.

In contrast to the cross-measure borehole method, the superjacent heading method has required little fresh development of mining technique. An example of practice in the Ruhr demonstrates general principles involved. At Emsche Lippe Colliery firedamp was diverted from a gassy working by building dams across two headings in an upper horizon. One of the headings was an existing abandoned roadway, and the other specially driven for the work. The layout is indicated in Fig. 2. Pipe lines were extended through the dams and sealed, suction being obtained by connecting the line at the surface to a selected point in the gas system at the pithead coke ovens.

European Experiences

It is reported that firedamp drainage is now being used or installed at about 70 European collieries. Of these about 35 are in Belgium, 12 or more in the Saar, 12 or more in the Ruhr, and the others in Great Britain and France. Most of them use the cross measure borehole system and the remainder (mainly in the Saar) operate superjacent headings.

At Mansfeld Colliery, described above, firedamp drainage has been continuous for nearly 10 yr, except for a period immediately after the war. The faces in the first district drained have been worked out and the original drainage system with individual bore holes connected to the pipe range has been replaced by converting the return airway to a drainage heading, while operations by cross-measure boreholes have extended to new developments in other districts. Thus the total yield of firedamp from the installation has been maintained, and operation has been regular. At Hansa, another colliery in the Ruhr, cross-measure boreholes have been used in a number of districts. Outstanding features of the results at Hansa include the following:

(1) Firedamp can be drained from workings in virgin coal but the flow of gas from boreholes is very small unless some mining operations are in progress in the vicinity.

(2) When a borehole is first in operation at the roadhead, very little gas is yielded. As the face advances, the gas yield rises to a maximum generally when the hole is 100 or so yards outbye.

(3) The yield from the boreholes is much increased if mining is commenced in an adjacent seam, particularly below the district being drained. Examples were obtained at Hansa of boreholes giving lower yields until adjacent mining operation commenced, and giving subsequent increases of gas when further mining took place in lower seams not immediately adjacent.

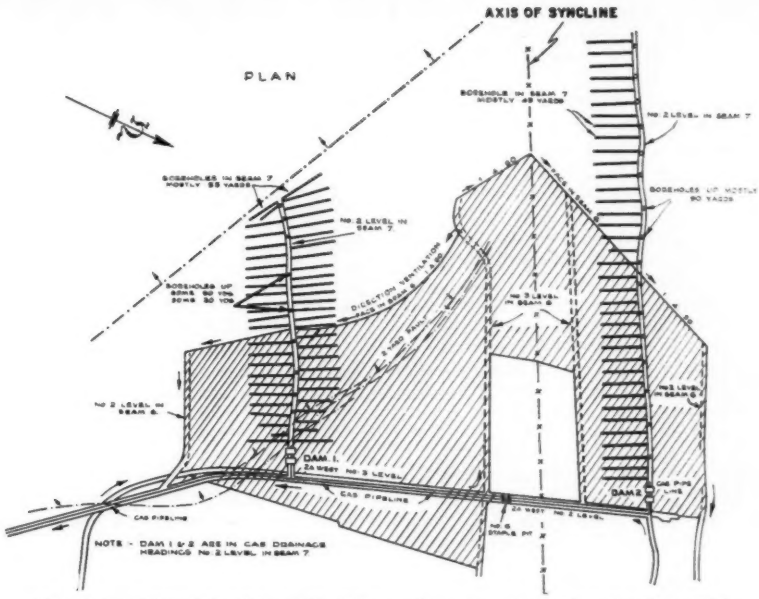


Fig. 2—Superjacent heading method for methane recovery at Emsche Lippe Colliery, also in the Ruhr

The relation between effectiveness of gas removal and progress of mining operations is not so well defined when superjacent heading methods are used as when the behavior of individual boreholes can be observed. Superjacent headings have been used in very gassy parts of mines and not exclusively in virgin coal; operations have been successful in areas of a mine already worked. It is still generally observed that maximum release of gas occurs when the ground is moved by adjacent mining operations but since there can be no measurement of flow from individual sources of gas, the relation of flow to mining operations cannot be observed with the same precision as in the cross-measure hole method.

There is one example of drainage by superjacent headings in the Saar coal fields which may be of particular interest and importance for its possible application to practice in the United States. This is at Hirschbach Colliery in the Saar where gas was first drained from a seam above a room and pillar area. Here the sequence of mining operations was straightforward but the results are particularly interesting. Seam No. 20 is a seam of medium volatile bituminous coal in which development commenced with an area laid out for extraction by room and pillar mining with full mechanization and pillar recovery. It is the bottom of a series of seams, at a depth of about 1800 ft. There are 40 unworkable bands in the 608 ft of strata above this seam to the next worked seam, and it was feared that gas would penetrate into the pillar workings.

Two headings were driven in a 2-ft 8-in. seam, 88 ft above seam 20, and the entries sealed by dams. (See Fig. 3.) Gas flow rose to a maximum when pillar extraction was in full progress, the volume withdrawn from the headings being 466 cfm at 60-80 percent methane. This represented 60 percent of the total yield of methane from the district. In order to test the effectiveness of drainage the system was disconnected for two shifts by which time the methane in the return airways of seam No. 20 was doubled. The drainage was in fact fully effective in maintaining a safe environment for mechanized equipment. In order to maintain optimum flow of gas, suction was applied at the dam outlet, increasing the gas flow but not causing any serious ingress of air. Later, the mine changed to longwall operation, and the drainage was continued to

control gas at these faces. While no quantitative comparison was made between effects in longwall and pillar areas, the system as a whole continued to operate effectively, about 50 percent of the total methane emission being diverted to the drainage system.

Experiments in England

In Great Britain, work is most advanced at Haig Colliery in the West Cumberland coal field. The colliery workings are entirely undersea, and the present faces are worked mainly in two seams between three and four miles from the shafts which are sunk at the cliff edge. Six parallel, 14-ft by 10-ft roadways extend from the shaft bottom to the mining areas, forming intake and return airways. Two booster fans are installed at the inbye end of the return airways.

There are several unusual features in the Haig experiments. Not only did the work begin systematically with a full ventilation survey of the selected area, but when the first boreholes were ready for work, an exhauster was used underground and located close to the boreholes to permit measured suction to be applied to individual holes. This is in contrast to previous practice where suction had only been made available by laying the pipe line in advance of boring operations, which involves great expense. A water jet ejector and subsequently a water sealed rotary exhauster have been found useful for underground as well as surface operation; trials under especially difficult conditions having shown that many conventional exhausters of the vane or rotor type are unsuitable for this duty. It was thus possible to determine the likely output of gas from boreholes in a number of locations, inclined in a number of directions, bored to differing depths, and otherwise representing a range of conditions. These are believed to be the most comprehensive experiments yet carried out on the cross-measure borehole technique. A final account will be published subsequently as present developments of this work promise to be very extensive.

On the basis of the exploratory stages, a full scale installation was planned. This involved much heavy specialized engineering. A 3½-mile line of 14-in. pipe has been laid in a return airway extending to the surface by the upcast shaft. Smaller branches connect to the boreholes, and exhausters and control instruments are installed at the surface.

This system was first brought into operation in June, 1952. Drainage of gas at partial capacity was achieved by the natural draft of the shaft section and underground rise of the pipe range. As soon as the drainage installation was working at part capacity, the methane content of the ventilation air leaving the area was reduced and subsequently, when exhausters at the surface were brought into use, the flow of gas from the system was increased with a corresponding over-all reduction of the methane content in the return airways from the drained areas of about 50 percent.

Drainage from Longwall Faces

Underground operations leading to changes in gas conditions were started as an essential aid to coal production in Stafford No. 2 Colliery, near Stoke-on-Trent in the North Staffordshire coal field. In this coal field there are a large number of coal seams extending to a great depth, which have been worked successfully at nearly 4000 ft. At Stafford Colliery the Bowling Alley coal is mined at about 3000-ft depth, and in normal development gas emission has been so great that the rate of working has been limited. After some initial difficulties due to inadequate drilling equipment, a series of boreholes was made, directed upwards from the tailgate and return airway of a strip-packed face in a selected area. Methane was emitted at a small pressure of a few inches water gauge. Application of a moderate suction greatly increases the potential flow of gas, and with such arrangements it has been found possible to remove sufficient gas to permit uninterrupted working of the face without limitation of output.

The Point of Ayr colliery in North Wales is an unusual and possibly unique site for firedamp drainage. A detailed account (Firedamp Extraction at Point of Ayr, Transactions of the Institute of Mining Engineers, 1951, p. 111) has been given by Stuart J. Young, mining agent at Point of Ayr for many years, on which this brief summary is based. The colliery is on the seaward extremity of the

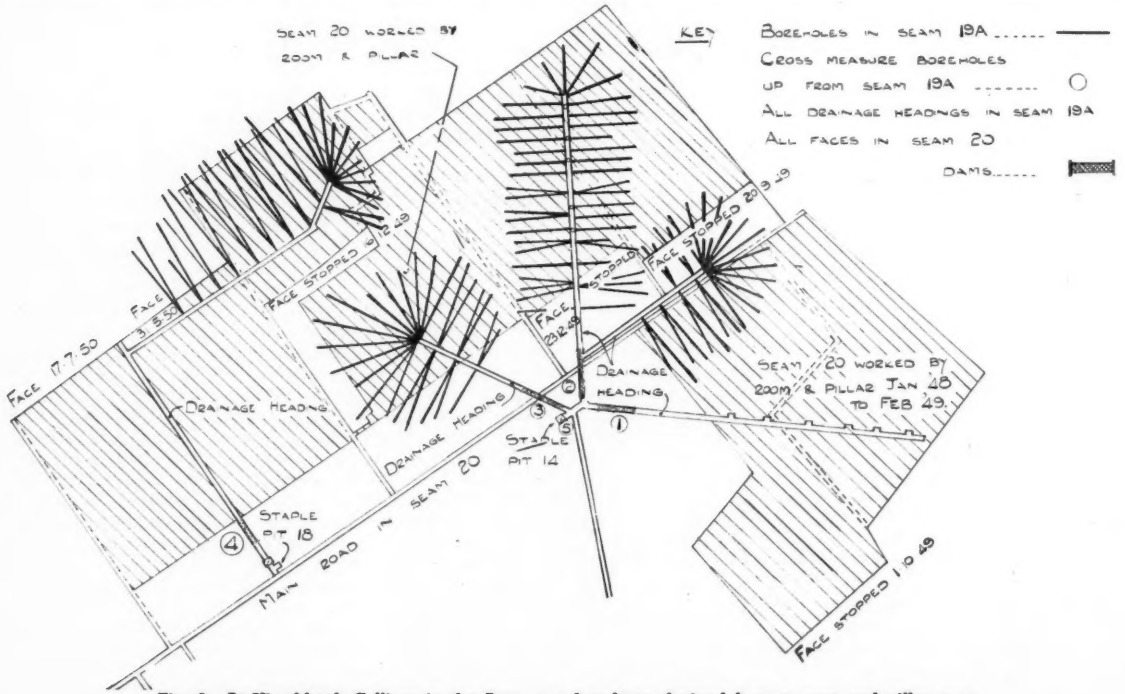


Fig. 3—At Hirschbach Colliery in the Saar, gas has been drained from a room and pillar area

estuary of the River Dee in Northwest Wales. A succession of seams has been mined in descending order and for 50 yr it has been the practice to drill vertically downwards from the seam worked at any one time to the next seam below. When these boreholes intercept the seam, gas flows at once, under a very high potential pressure. If the holes are sealed and their stop valves closed, the pressure of the gas may rise as high as 300 psi. When led without obstruction to the pipe line, borehole pressure is about 15 psi and gas flow about 50-150 cfm. The holes yield quantities of salt water which is trapped before the gas is led to the pipe line.

In contrast to the conditions observed at many of the longwall workings, the pattern of gas flow is remarkably stable. Because of the geological conditions and the location of much of the mine undersea, extraction at the colliery is limited and no pillars are recovered. Thus ground movements are relatively small. Yet the flow of gas seems steady and unhindered by this feature of strata stability, whereas gas flow in longwall installations depends largely on strata movement. Some holes seem independent of others bored in the immediate neighborhood, but others show mutual interactions, the pressure and flow of gas from one being affected by changes in the other. Gas flow from the individual holes continues with a gradual decrease over a few years, the average useful life of a borehole being about three years, though some have continued to discharge for much longer.

All the holes are at present connected to a pipe line of rather small diameter, but it is planned to replace this by a large diameter pipe system. For some years the line discharged into the upcast shaft either at the pit bottom or at the surface. Since 1950 the colliery boilers have been fired by the gas and coal has been entirely replaced as regular boiler fuel.

Analysis of Results

Every drainage system so far described was started with the main practical aim of raising the standard of safety of the actual mining operations. There is, however, the example of purely exploratory and experimental boring carried out at the Dutch State mines and reported briefly by de Braaf and his colleagues. (Rev. de l'Industrie Minerale, 32, 1951, p. 405 and Special Reports at Proefstation, Nederlandse, Staatsmijnen in Limburg.) This work has been carried out well in advance of any pressing requirements for installing firedamp drainage at the collieries concerned, one of its objects being to obtain basic data to plan the first stages of drainage when mining conditions render this necessary.

Work included studies of the mode of firedamp emission independent of any drainage operations or experiments. A program of experimental boreholes was also carried out. From the studies of firedamp emission into airways and its accumulation, it was shown that over 93 percent firedamp release takes place at or near the coal face during working of the mine.

Experimental boreholes were made in advance of a face worked longwall with advance headings. Careful measurements were made of gas flow, pressure and composition and the permeability of the surrounding strata to gas.

The experimental boreholes confirm that gas emission is very closely related to strata stability and movement and is at its greatest when the face is a few yards, but only a few yards, away from the borehole site. Gas pressure is high when the holes are first drilled. In many cases flow is associated with a lower pressure (about two atmospheres) which occurs when the face in the seams under examination or in an adjacent seam approaches the borehole region. The permeability or some equivalent such as porosity increases as the ground is disturbed by mining and is not reversible. Some approach to quantitative treatment of firedamp emission is possible by these means. It is well established in a qualitative way that methane emission is associated with active mining operations, and is much reduced if working ceases, but data for a fully quantitative treatment are not yet available.

Draw Conclusions

On the basis of all such experimental results as can be subjected to analysis, the following very general conclusions have been drawn in a tentative way. Such conclusions indicate the precision with which phenomena of firedamp drainage can now be described systematically.

(1) There is a high probability that methane can be withdrawn from coal measures in significant quantities where coal is worked for the first time from one of a number of gassy seams which are closely adjacent.

(2) The gas is most readily collected from the strata adjacent to the working in the selected seams, either by drilling a succession of boreholes to traverse the adjacent coal measures, or less frequently by mining headings in the adjacent measures.

(3) The gas flows most readily when the strata is being disturbed by mining operations. It is not uncommon for volumes of the order of 100 cfm with 80-95 percent methane content to flow from a single borehole. Higher rates have been observed—particularly when the borehole is not vertical, but inclines upward and over the face or wastes in a longwall development.

(4) The gas generally exerts only a moderate pressure of a few inches water gauge. In a very few examples much higher pressures have been observed in holes which will also yield a considerable volume of gas.

(5) It is not generally possible to extract important quantities of gas by boreholes made into exposed faces of coal now being mined. Sometimes gas accumulates, perhaps at pressures of several atmospheres in such holes, but the flow rate is very small.

(6) No precise relation has yet been evaluated between the yields of gas and the amounts found in laboratory experiments absorbed on coal.

Most conclusions which have been drawn in one way or another are implied by the observations listed above. While the selection of sites for new work now appears to be fairly well understood it is not possible to predict outputs of gas or duration of flow from an area with any certainty. No relation has so far been evolved between gas emission and such properties of coal as its porosity, permeability or friability or its ultimate analysis.

Acknowledgments

These notes have been compiled with permission of the Director-General, Scientific Department, National Coal Board, London, to whom the author records his thanks. Help is gratefully acknowledged from many colleagues and acquaintances in the coal industries of Europe, especially Mr. J. G. Bromilow, Chief Ventilation Engineer, and the Divisional Chief Scientists, Northern and Northwestern Divisions, National Coal Board; from Dr. Tideswell and the Director, Safety in Mines Research Establishment and Dr. Winstanley, Deputy Chief Inspector of Mines; and the Directors and Engineers, Institut de l'Industrie Charbonniere Belge, Charbonnages de France, Regie des Mines de la Sarre and Deutsche Kohlen Bergbau Leitung, Essen.

Clearly a great measure of systematic investigation and research will be needed to establish a close understanding of the phenomena of firedamp drainage. This will be assisted by the extensive observations now being made at all the British installations, including observations of gas flow, pressure and composition and their variation with changing operations. The important work begun in Holland will no doubt continue for the

(Continued on page 64)

Metallurgical Formulas*

THE following formulas were developed by Mr. Warneke during his long association not only with design and construction, but also with the operation of ore dressing plants. They are being published in the hope that they will prove of value to others in the ore dressing industry.

By F. WARNEKE

Chief Technical Officer, Mining Department
Vickers Ruwolt Pty., Ltd.,
Richmond, Victoria, Australia

Pulp Calculations

W—Tons of solids per 24 hours.
R—Ratio of weights: solution/solids.
V—Ratio of volumes: solution/solids.
L—Specific gravity, solution.
P—Specific gravity, pulp.
S—Specific gravity, solids.

Specific Gravity Details

$$L = \frac{PRS}{S(R+1) - P}$$

$$P = \frac{R+1}{\frac{R}{L} + \frac{1}{S}} = \frac{LS(R+1)}{RS+L}$$

$$S = \frac{PL}{L(R+1) - PR}$$

Pulp Details by Weight

$$R = \frac{\text{Weight of Solution}}{\text{Weight of Solids}} = \frac{L(S-P)}{S(P-L)}$$

$$\%\ \text{Solution} = \frac{100\,R}{R+1} = 100\,\frac{L(S-P)}{P(S-L)}$$

$$\%\ \text{Solids} = \frac{100}{R+1} = 100\,\frac{S(P-L)}{P(S-L)}$$

Flotation

To estimate the number of cells required for a flotation operation in which:

W—Tons of solids per 24 hours.
R—Ratio by weight: solution/solids.
L—Specific gravity, solution.
S—Specific gravity, solids.
N—Number of cells required.
T—Contact time in minutes.
C—Volume of each cell in cu ft.

Long Tons of Solids

$$N = \frac{W \times T}{40 \times C}\left(\frac{R}{L} + \frac{1}{S}\right)$$

Short Tons of Solids

$$N = \frac{W \times T}{45 \times C}\left(\frac{R}{L} + \frac{1}{S}\right)$$

In the above formulas, no allowance is made for the degree of aeration of the pulp nor the decrease in the volume of same, during the flotation operations.

Conditioning or Dissolving

To estimate the volume of the tank or group of tanks, required for the conditioning of a pulp for flotation, or for the dissolving of certain solids as contained in a pulp of which:

W—Tons of solids per 24 hours.
R—Ratio by weights: solution/solids.
L—Specific gravity, solution.
S—Specific gravity, solids.
T—Contact time in minutes.
C—Volume of the tank in cu ft.

Long Tons of Solids

$$C = \frac{W \times T}{40}\left(\frac{R}{L} + \frac{1}{S}\right)$$

Short Tons of Solids

$$C = \frac{W \times T}{45}\left(\frac{R}{L} + \frac{1}{S}\right)$$

Pulp Thickening

To estimate the flow of clear solution in gallons per minute from a thickening operation in which:

W—Tons of solids per 24 hours.
L—Specific gravity of solution.
R—Ratio by weight, solution/solids in original pulp.
R—Ratio by weight, solution/solids in thickener discharge or filter cake.

Long Tons of Solids

Imp. gallons of solution per min.

$$\frac{7}{45} \times \frac{W}{L}(R - R_1)$$

U. S. gallons of solution per min.

$$\frac{14}{75} \times \frac{W}{L}(R - R_1)$$

Short Tons of Solids

Imp. gallons of solution per min.

$$\frac{5}{36} \times \frac{W}{L}(R - R_1)$$

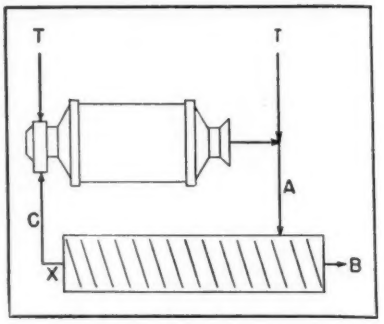
U. S. gallons of solution per min.

$$\frac{1}{6} \times \frac{W}{L}(R - R_1)$$

Simple Classification

To estimate the circulating load in and the efficiency of a classifier operating in closed circuit with a ball mill. Original feed may be applied at the ball mill or the classifier.

T—Tons of original feed.
X—Circulation factor.
A—% of minus designated size in feed.
B—% of minus designated size in overflow.
C—% of minus designated size in sands.



Circulating load = XT.

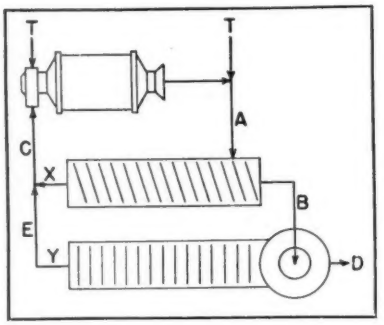
$$\text{Where } X = \frac{B - A}{A - C}$$

Classifier efficiency:

$$100\,\frac{B(A-C)}{A(B-C)}$$

Compound Classification

To estimate the circulating loads in and the efficiency of each of the two classifiers operating in closed circuit with a ball mill:



Original feed may be applied at the ball mill or the primary classifier.

T—Tons of original feed.
X—Primary circulation factor.
Y—Secondary circulation factor.
A—% of minus designated size in feed.
B—% of minus designated size in primary overflow.
C—% of minus designated size in primary sands.
D—% of minus designated size in secondary overflow.
E—% of minus designated size in secondary sands.

Primary circulating load = XT.

$$\text{Where } X = \frac{(B-A)(D-E)}{(A-C)(B-E)}$$

Primary classifier efficiency:

$$100\,\frac{B(A-C)}{A(B-C)}$$

Secondary circulating load = YT.

$$\text{Where } Y = \frac{(D-B)}{(B-E)}$$

Secondary classifier efficiency:

$$100\,\frac{D(B-E)}{B(D-E)}$$

Total circulating load (X + Y) T.

* Reprinted from Deca Trefoil.

Wheels of GOVERNMENT

AMC

As Viewed by HARRY L. MOFFETT of the American Mining Congress

THE first session of the 83rd Congress passed into history shortly after midnight August 3.

While this Congress, first under a new Administration in 20 years, required time to get organized and under way, it did grind out an impressive sheaf of legislation. Among its accomplishments were passage of measures extending the excess profits tax, providing funds for Government operation after slashing almost $13 billion from the recommendations of former President Truman, discarding most economic controls, liquidating the Reconstruction Finance Corporation, setting foreign aid at $4.5 billion, giving the tidelands to the States and keeping the Continental Shelf under Federal control, renewing the Reciprocal Trade Agreements program, approving 10 executive department reorganization plans, and a host of minor laws.

The Congress also authorized a great number of studies and investigations, most of which will find their way into legislative channels next year. These range from economic policy studies, foreign trade surveys, and tax revision, to agricultural price supports and an investigation of the condition of the nation's mining industry.

The Administration suffered a staggering blow with the loss of Senator Taft (Rep. Ohio). Not only did it lose its ablest legislative leader on Capitol Hill, but its control of the Senate was left dangling by a thin thread. Should Governor Lausche of Ohio appoint a Democrat to succeed Taft the line-up in the Senate would be 47 Republicans, 48 Democrats and one Independent. Senate Minority Leader Johnson (Dem. Tex.) has said that the minority will not take advantage of this situation to assume control of the upper body. Even in the House, the control by the Administration is only by eight votes. These facts, coupled with the fact that 1954 is a Congressional election year, are likely to result in the next session's being colored with political overtones.

Members of Congress, at home campaigning or abroad investigating American foreign policies, will have their ears attuned to the White House late this month when President Eisenhower gets together with Congressional and Administration leaders, to determine whether to call a special session this Fall to deal with an increase in the public debt limit. The eleventh hour appeal at the last session for a boost of $15 billion in the present limit met with success in the House, but the Senate Finance Committee tabled the matter.

In the event a special session is called it would no doubt make a start on the huge pile of legislation that is likely to come before the next regular session. This embraces such important matters as tax law revision, social security revampment, Taft-Hartley Act changes, reorganization plans, St. Lawrence Seaway, natural resource development, international trade, statehood for Hawaii and Alaska, and appropriations.

Tax Revision on Way

One of the major subjects to come before the next session of the Congress will be revision of the revenue laws. The House Ways and Means Committee has just concluded lengthy hearings on the Internal Revenue Code and will place major recommendations for amendments before Congress next year. Chairman Dan Reed (Rep. N. Y.) told reporters upon closing the hearings that the mountain of testimony taken by the Committee more than demonstrated that existing tax laws are unfair, confusing and antiquated.

During the course of these hearings, Chairman Henry Fernald of the AMC Tax Committee presented the mining industry's views as to needed changes in the Code dealing with depreciation and amortization; net operating loss; consolidated returns intercorporate dividends; and statute of limitations, assessment and collection of taxes and penalties. He also urged particularly that nothing be done which would reduce the presently established depletion allowances for mines, terming these allowances essential to maintain our domestic industry.

Meanwhile, the Treasury Department is going over the Revenue Laws with a fine tooth comb and is expected to make recommendations to the next Congress for their revision. These recommendations will probably be the subject of further exhaustive hearings by the Ways and Means Committee.

Another factor pointing to the pressing need for action on taxes next year is the necessity of offsetting some revenue losses from expiration of the excess profits tax December 31 and from the forthcoming 11 percent reduction in personal income taxes on the same date. It has been estimated that tax revenues will drop by about $7.5 billion due to these changes. The Administration, which will present its first budget next year, is driving hard to present a balanced one for the 1954 fiscal year, and has ordered stringent economy in Government operations and elimination of "fat"

Washington Highlights

TAX OVERHAUL: Under study.

TRADE POLICY: New legislation next year?

T-H REVAMPING: Scheduled for 1954.

PUBLIC LAND LAW: Revision delayed.

SOCIAL SECURITY: Changes likely.

COAL MINE SAFETY: USBM reports progress.

in agency and department budget requests.

Just prior to adjournment, Congress approved a measure providing up to $20,000 gross exemption annually from U. S. income tax for non-Federal workers who remain abroad for 17 out of 18 consecutive months.

To Study Foreign Trade

In extending the Reciprocal Trade Agreements Act until June 12, 1954, Congress provided for a 17-member commission to study tariffs and foreign trade policy and make recommendations for new legislation by next March. The President has named Clarence B. Randall, chairman of the board of Inland Steel Co., to serve as chairman of the Commission. Congressional members are Senators Millikin (Rep., Colo.), Hickenlooper (Rep., Iowa), Bush (Rep., Conn.), George (Dem., Ga.), and Byrd (Dem., Va.), and Representatives Reed (Rep., N. Y.), Simpson (Rep., Pa.), Vorys (Rep., Ohio), Cooper (Dem., Tenn.), and Richards (Dem., S. C.). The other members of the Commission are: Jesse W. Tapp, vice-president, Bank of America; John H. Whitney of John H. Whitney & Co.; David J. McDonald, president, CIO Steelworkers; Cola J. Parker, chairman of the Board, Kimberley-Clark Corp.; John H. Williams, professor of ecoonmics at Harvard; and Lamar Fleming, Jr., president of Anderson, Clayton & Co.

Congress also provided in the extension measure that the Tariff Commission, in considering steps to expand foreign trade, must be sure that any action "is consistent with a sound domestic economy, our foreign economic policy, and the trade aspects of our national security and total foreign policy."

Following the House defeat of the Simpson bill to provide a sliding scale tariff on lead and zinc and impose import quotas on foreign residual oil, the U. S. Tariff Commission announced a general investigation of the effects of lead and zinc imports on the domestic lead and zinc industries and on mine labor. The study is to be completed before March 31, 1954, and a report made to Congress by that time. It was undertaken after both the House Ways and Means Committee and the Senate Finance Committee had adopted resolutions calling for such action.

Public hearings will begin November 3. All mining interests have been asked to submit their views to the Commission as soon as possible.

T-H Revision Next Session

Revision of the Taft-Hartley Act will be a major problem for Congress in 1954.

While the House and Senate Labor Committees held extensive hearings this year they failed to make any recommendations for amendments pending submission of the Administration's program. The White House prepared a "draft" of revisions to the law but premature press "leaks" prevented its being submitted to Congress. Text of the "draft" as published indicated that most of its provisions would weaken the Act in favor of organized labor—including proposals which would in effect override State right-to-work laws and make the Federal law paramount; would exempt small employers, now covered, from the law's application; limit the classification of supervisory employes; terminate union responsibility for a member's actions solely because of membership; authorize more hiring through unions and give them a greater voice in fixing hiring practices; ban the mandatory injunction petitions in secondary boycott cases; bar a representation election sooner than four months after the beginning of a strike, and permit an employer voluntarily to waive participation in the administration of a welfare fund to which he contributes.

A storm of protest arose on Capitol Hill when these proposals appeared, and they are likely to undergo drastic revision before being sent to Congress. Some rumors now prevailing have it that the White House will not send any Taft-Hartley recommendations to Congress but will leave revisions entirely up to the lawmakers.

Delay Mining Law Revision

Special subcommittees of the House Agriculture and Interior Committees, named to draw up compromise legislation dealing with revision of the public land laws to curb abuses under the present laws, have not held any sessions as yet and it is likely that they will not get together before the next session of Congress.

The House Interior Committee members championed the cause of the mining industry at the past session, and are seeking ways to write legislation that will check fraudulent use of mining locations and at the same time give continued encouragement to mineral development. In the next few months they will gather data from Western mining States as to desirable and feasible changes in the mining laws, with a view to presenting the latest views of the mining industry and other land users at any conference with the House Agriculture subcommittee at the next session. A large number of the Interior Committee members will attend sessions of the American Mining Congress at Seattle and learn more about the problem at first hand.

Meanwhile, the Senate Interior Committee has failed to act on a measure by Rep. Regan (Dem. Texas) which would remove sand, common stone, gravel, and cinders from acquisition under the mining laws. It is expected that the Committee will hold hearings on the bill at the next session.

A measure by Senator Murray (Dem. Mont.), which passed the Senate and failed to be considered by the House, would change the deadline for completing annual assessment work on mining claims from July 1 to October 1 of each year. It is expected that this measure will receive House approval early next year, after being amended to provide that $125 worth of labor or improvements would be required on each mining claim during the period July 1, 1953 to October, 1954.

Congress has enacted a measure which would validate mining claims staked prior to January 1, 1953, on lands subject to oil and gas prospecting permits or leases. Adoption of this Act followed months of sporadic hearings before both the House and Senate Interior Committees. It is designed to protect locators of uranium claims on public lands subject to the mineral leasing laws and not legally open for location under the mining laws.

Social Security Changes in Prospect

Congress failed to take any action to defer the scheduled January 1, 1954 increase in the old-age insurance tax from 1½ to 2 percent, despite a Presidential request that this be done.

Last minute efforts to accomplish this failed when Chairman Dan Reed (Rep. N. Y.) announced on July 30 that it was "highly unlikely" his Committee would take any action to freeze the tax at current levels. In making this announcement Reed stated, "I am not at all convinced that the present Social Security tax schedule is necessarily the best. On the other hand, I have as yet seen no convincing evidence that it is wrong."

Reed stated that a subcommittee of the Ways and Means Committee—headed by Rep. Curtis (Rep., Nebr.)—is studying the whole Social Security problem. He expressed the hope that legislation would be developed that would remove many of the inequities and discriminations in the present system.

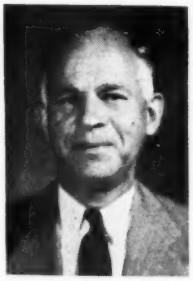
Meanwhile, the Administration has completed work on a broad-scale Social Security bill which would extend O.A.S.I. coverage to some 10 or 11 million workers not now covered. The measure is based on the recommendations of a twelve-member special advisory group appointed earlier this year by Health, Education and Welfare Secretary Oveta Culp Hobby. The bill reportedly calls for virtually universal coverage.

(Continued on page 60)

AMC Personals

Keith Whiting, Salt Lake City, in charge of exploration and engineering for the western division of the American Smelting & Refining Co., has been appointed head of the recently organized Toronto, Canada, office of the company in charge of their interests in eastern Canada.

A. R. Matthews, president of Pocahontas Fuel Co., Inc., announced the appointment, effective August 1, of **Earl G. Robertson** as vice-president in charge of sales for the company. Robertson formerly was vice-president of The Pittston Co., New York, vice-president in charge of sales of the Clinchfield Coal Corp., Cincinnati, and chairman of the board of the Clinchfield Fuel Co., the latter two companies being subsidiaries of The Pittston Co.



Theodore Marvin, director of advertising for Hercules Powder Co., has resigned to become president of the Michigan Chemical Corp. of St. Louis, Mich. Director of advertising for Hercules since 1944, Marvin has been with the company for 30 years.

On August 1, **W. C. Schott,** Stonega Coke and Coal Co., Big Stone Gap, Va., was promoted from general superintendent to general manager. At the same time **S. H. Neely, Jr.,** was named manager of stores for the company at Stonega, Va. He had been manager of the Andover Shopping Center, Andover, Va., operated by Stonega.

Albert Crase recently resigned as president and general manager of Idaho Maryland Mines Corp., California's biggest gold producer. **Bert C. Austin** succeeds Crase as president and general manager. **Max Bechhold** has been appointed vice-president and assistant to the president.

Harry J. Connolly, president of the Pennsylvania Coal Co. since 1939, has been elected chairman of that company's Board of Directors. **Ralph A. Lambert** was elected to succeed Connolly as president. Lambert has been with the coal company since 1940, and was vice-president and general manager at the time of his promotion.

L. E. Grubb, former general superintendent of the International Nickel Co., Inc., Bayonne, N. J., Works, has been appointed general superintendent of Inco's Huntington, W. Va., Works, according to an announcement by Dr. Paul D. Merica, president of the company. At the same time, **P. H. Flynn,** who had been assistant superintendent of the company's Bayonne, N. J., Works, was named general superintendent succeeding Grubb.

George R. Powe, former assistant superintendent of the Roslyn coal mines for the Northwest Improvement Co., has been appointed chief mining geologist of the Northern Pacific railway. At the same time **V. A. Gilles,** chief Northern Pacific geologist since 1940, was named consulting geologist with headquarters in Billings, Mont.

George H. Love, president of Pittsburgh Consolidation Coal Co., announced that the Board of Directors had elected **G. O. Tarleton** as president of Consolidation Coal Co. (Ky.) Division. He succeeds **S. M. Cassidy,** who has been transferred to Pittsburgh as vice-president of the parent company.

G. O. Tarleton

Tarleton started with the operating department in March, 1928, and since July, 1946, has been vice-president of the Kentucky Division. He will continue to make his headquarters at Jenkins, Ky.

Two promotions have been announced in the Universal Atlas Cement Co., a subsidiary of United States Steel Corp. **Charles B. Baker,** vice-president and general attorney, was elected executive vice-president, and **Donald C. Leo,** secretary, was appointed general attorney, both with offices in New York City.

Dr. Ernest Newton Patty, well-known Alaska mining man and educator, has accepted the presidency of the University of Alaska.

Russell W. Decker has joined the firm of Robinson and Robinson, Consulting Engineers of Charleston, W. Va., to manage the Coal Preparation Department. Decker is well known throughout the coal industry, having been with the Fairmont Machinery Co. for 28 years as engineer and later as sales manager.

At the 50th anniversary meeting of the Idaho Mining Association, held at Sun Valley, Idaho, July 13-16, **R. D. Leisk,** general manager of the Sunshine Mining Co., was elected president of the Association for the next two years, succeeding Henry L. Day, president of Day Mines, Inc. **L. E. Troeger,** Conda, Idaho, associated with the Anaconda Copper Mining Co.'s phosphate operations was elected vice-president, and **Harry W. Marsh,** Boise, was re-elected secretary.

R. D. Leisk

Virginia Smokeless Coal Co. announces the appointment of **D. H. Lewis** as general sales manager and **K. J. Heatherman, Jr.,** as assistant sales manager. As soon as arrangements can be made, their offices will be located in Cincinnati.

Lewis was formerly manager of the Indianapolis office of the Republic Coal & Coke Co. and more recently field sales manager of Republic.

Heatherman was formerly vice-president of sales of the Jones & Heatherman Coal Co. and its successor corporation, Ridgewood Coal Co., which was merged on April 30, 1953, into Jewell Ridge Coal Corp.

Roy B. Earling has opened an office as a mining consultant in Seattle, Wash.

Several promotions were effected April 1 by the Chile Exploration Co. at Chuquicamata, Chile, according to an announcement by Charles M. Brinckerhoff, general manager.

Glen S. Wyman, previously mine superintendent, was appointed to the position of general superintendent of operations; former assistant mine superintendent **L. E. Fish** was advanced to the post formerly held by Wyman, and **R. C. Becker** formerly chief mine engineer, has been named assistant mine superintendent.

L. K. Wilson, geologist for American Smelting and Refining Co., has been transferred to the San Francisco office of the company, Mining Department, 405 Montgomery St. **Kenyon Richard** was named to succeed Wilson in the southwest office at Tucson, Ariz.

Howard E. Simpson, executive vice-president of the Baltimore and Ohio, was elected president at a recent meeting of the Board of Directors. The election was effective September 1. Simpson succeeds Colonel **Roy B. White,** who has been president of the B&O since June 1, 1941, and who was elected chairman of the Board.

At a recent meeting the Board of Directors of Inspiration Consolidated Copper Co. filled the vacancies caused by the recent death of William D. Thornton, formerly president and director. **Richard S. Newlin,** a director and vice-president, was elected president, and **H. Myles Jacob,** secretary and treasurer, was elected a director.

R. S. Newlin

Spokane Portland Cement Co. recently announced the election of **Gales M. Bell** as president to succeed **Walter B. Neill,** who has retired under an extended leave of absence. At the same time the election of **W. W. Witherspoon** to treasurer of the cement company was announced.

Ted Evans, mining engineer, has been added to the Sunbright, Va., staff of the Foote Mineral Co. as mining superintendent.

J. B. Pullen, manager of Phelps Dodge Corp.'s New Cornelia Branch at Ajo, Ariz., was transferred to the corporation's Douglas office on July 1. He will serve as an assistant general manager, taking over certain duties in the offices of general manager **Charles R. Kuzell** and assistant general manager **W. C. Lawson.**

A. T. Barr, formerly general superintendent of the New Cornelia Branch, will succeed Pullen as manager.

Prof. **Harold L. Walker,** Head of the Department of Mining and Metallurgical Engineering left the University of Illinois September 1 to become a partner in the M. & N. Engineering Co., at their branch in Taunton, Mass.

Professor Walker came to the University in 1938 as an assistant professor of metallurgical engineering. He has been head of the Department of Mining and Metallurgical Engineering since 1942. During 1947 and again in 1949 Professor Walker served as interim Director of the Illinois State Department of Mines and Minerals. In 1950-51, at the request of Governor Adlai E. Stevenson, Professor Walker codified, revised, and rewrote the coal mining laws for the state of Illinois. With some modifications this new mining code was passed by the last session of the General Assembly.

Professor Walker was also given a leave of absence from the University in 1945 to serve as scientific consultant for the Foreign Economic Administration for Scientific Investigations of German metallurgical practices developed during the last war.

He is currently vice-president of the Illinois Mining Institute.

At a recent meeting of the board of directors of Greene Cananea Copper Co., **Clyde E. Weed,** a director and vice-president, was elected president of the company, and **Edward S. McGlone,** a director, was elected a vice-president. These elections filled the vacancies caused by the recent death of William D. Thornton.

Appointment of **James H. Cunningham,** of the Bituminous Coal Institute staff, to the post of assistant director of public relations has been announced by Ralph C. Mulligan, director of public relations. Cunningham joined the Institute as assistant director of the Educational Department and director of the Speakers' Bureau in July, 1948. He has been administrative assistant to Mulligan since early in 1951.

— *Obituaries* —

Arthur Erickson, 70, retired mining engineer from Salt Lake City, died recently while vacationing in Idaho. Mr. Erickson had been affiliated with many mining and smelting enterprises during his long career and was well known in mining circles for his many innovations in metals processing. He was born May 31, 1883, and began his mining career when he joined the engineering department of the then U. S. Mining Co. before graduating from the University of Utah in 1906.

Among his many accomplishments, Mr. Erickson designed a complete secondary aluminum plant at Perth Amboy, N. J., during World War II. He retired a year after this job was completed.

Erskine Ramsay, mining engineer, industrialist, and philanthropist, died in Birmingham, Ala., August 15. He was 88. Born in Six Mile Ferry, Pa., in 1864, Mr. Ramsay was the son of Scottish immigrants. His father was a coal mine superintendent. As a youth, Mr. Ramsay had worked for as little as $2 a month, yet he became a millionaire while in his early forties. At the age of 19, he was superintendent of the H. C. Frick Coke Co.'s Monastery Mines and the following year he was made superintendent of the Morewood Coke Co. and the South West Coal and Coke Co. Henry Clay Frick called him a "genius" in coal mine operations.

Mr. Ramsay accumulated his fortune after he entered into a partnership with G. B. McCormack and formed the Ramsay-McCormack Land Co. They bought, rehabilitated, and sold properties, banks, and businesses. Intensely proud of his ancestry, Mr. Ramsay frequently wore kilts on formal occasions.

He was a prolific inventor, having patented 40 devices for use in coal mining. He is credited with having invented the shaking-screen process, which he never patented.

Mr. Ramsay's gifts to education in Alabama amounted to hundreds of thousands of dollars. He had been president of the Alabama Board of Education from 1922 to 1941.

Theobald A. Day, 51, Chevy Chase, Md., suffered a fatal heart attack on August 21.

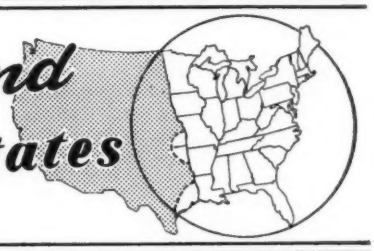
A native of Oak Park, Ill., Mr. Day was a graduate of Purdue University. At the time of his death, he had just resigned as Chief of the Press and Publicity Section of the Bituminous Coal Institute to accept a position with the Cleveland Rock Drill Division of the Le Roi Manufacturing Co. in Cleveland.

Lewis Dixon Knight, 74, died in Los Angeles in early June. Mr. Knight was northwestern manager of the Ingersoll-Rand Co. with headquarters in Butte until 1924, after which he occupied a position with the same firm on the West Coast, retiring in 1947.

Andrew J. Burns, 60, mine inspector for the U. S. Steel Corp. at Gary, W. Va., died in early June. Mr. Burns came to Gary in 1921. He advanced to cut boss and assistant mine superintendent. In 1935 he was made assistant to mine inspector and was later promoted to inspector.

NEWS and VIEWS

Eastern and Central states



Mine Safety Board Appointees

On August 6, 1953, two members of the Federal Coal Mine Safety Board of Review were sworn in at ceremonies in Washington. E. R. Price, manager of coal properties, Inland Steel Co., Wheelwright, Ky., was sworn in as the coal operators' member of the board. At the same time Charles R. Ferguson, safety director of United Mine Workers of America, was sworn in as a board member representing mine employes.

Price replaces Joseph G. Solari, assistant general manager of the Peabody Coal Co. His term will run until July 15, 1956. Ferguson has served on the board as the mine workers' representative since its organization in the late summer of 1952.

This leaves but one position vacant. By law the board can now function, but it is doubtful that it would want to handle any controversial problems without a public member in attendance.

Clay Conference

Genesis of Clays and Related Minerals will be the theme of the Clay Minerals Conference to be held at the University of Missouri, Columbia, Mo., on October 15-17, 1953. The Conference is sponsored by the National Clay Minerals Committee, a branch of the National Research Council.

—Harris & Ewing.

E. R. Price (right) and Charles Ferguson (center) were given the oath of office by Floyd Dotson, chief clerk of the Interior Dept.

Eagle-Picher Profits Up

In the recent Semi-Annual Report of the Eagle-Picher Co. to its stockholders for the six months ending May 31, 1953, net sales of the Eagle-Picher Co. and domestic subsidiaries for the first six months of the 1953 fiscal year were reported to be the largest for any first half-year in the company's history. Net profit, before and after provision for income taxes, was higher than for the corresponding 1952 period.

The record sales and improvement in net profit that were achieved during a period of low zinc and lead prices were made possible by the company's acquisition of the Ohio Rubber Co. a year ago and the liquidation of plants and inventories of the metallic products and paint and varnish divisions.

The report went on to say that construction of the new roasting, sintering and sulphuric acid plants at Galena, Kan., is proceeding on schedule, which means that they will be in production some time next summer.

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Safety Congress

Two symposiums—one on training methods and another on roof bolting—will highlight the mining sessions at the 41st National Safety Congress and Exposition to be held in Chicago, October 19-23.

Safety men attending the symposium on training methods on Wednesday, October 21, will hear the latest developments in that field from representatives of General Motors, Anaconda Copper, McIntyre-Porcupine Mines, Tennessee Copper, and the U. S. Bureau of Mines.

Roof-bolting developments will be discussed on Thursday afternoon by speakers from the Ruffner Ore Mine, Lake Shore Mines, Anaconda Copper, and the Bureau of Mines.

The mining sessions on Monday and Tuesday afternoons will be devoted to a variety of subjects. W. H. McPherson, consulting engineer, McPhar Engineering Co. of Canada, Toronto, will tell of the nondestructive method for mechanically testing steel-wire hoisting ropes under operating conditions. On the same program, A. D. Look, chief, accident prevention and health division, Phoenix Branch, U. S. Bureau of Mines, will speak on the topic, "Occurrence of Radon in Some Western Mines."

On Tuesday, October 20, E. D. Cory, chief electrical engineer, Cleveland Cliffs Iron Co., Ishpeming, Mich., will speak on radio communications in underground iron mines. The causes and control of rock bursts is the subject of P. J. Shenon, consulting geologist, Salt Lake City, Utah.

As in previous years, the American Society of Safety Engineers will present morning sessions on topics of general interest. Subjects will include nuclear energy, industrial lighting, electronic testing, safety training, research, human factors in safety, and others.

Roof Bolt Tests

Ohio Brass Co., in its July issue of "Haulage Ways," reports that wood headers, used in conjunction with roof bolting, may cause a decrease in roof bolt tension.

In one test a wood header was loaded in direct compression with a 5/16-in. by 6-in. by 6-in. steel plate. The bolt tension dropped approximately 15 percent in 600 hr. When another header was loaded approximately the same amount, but with a malleable iron washer (2 7/8-in. OD), bolt tension dropped approximately 72 percent in 600 hr. It was also found that the loss of tension occurred at an ever decreasing rate.

If bolt tension is any indication of bolt effectiveness as a means of roof support, it would seem possible that the use of wood headers would render bolts less useful.

In publishing the report, Ohio Brass stressed the fact that the tests were concentrated on the wood factor alone. They measured only the decrease in bolt tension due to wood cap pieces.

Residual Oil Does Hurt!

Up-to-the-minute data on economic conditions in West Virginia's mining communities were presented to the House of Representatives during the recent battle to restrict imports of residual oil. The figures, provided by Joseph Bierer, chief of the state's Department of Mines, and M. J. Ferguson, state tax commissioner, were included in a statement by Congressman Robert C. Byrd.

In the first six months of 1953 West Virginia's bituminous coal mining operations recorded a decline of approximately 2,750,000 man-days under the first half of 1952, Congressman Byrd reported. He also pointed out that 87 commercial mines—12 of them in McDowell County and 11 in Raleigh—have been forced to close since last January 25.

Congressman Byrd inserted in the *Record* a letter he received from Ferguson showing a decline of $1,677,-054.69 in state revenue from the Business and Occupation Tax for the fiscal year ending last June 30 as compared with the previous fiscal year.

"In other words," the letter stated, "this shows that there has been a considerable downward trend in the mining of coal, as the revenue derived from July 1, 1951, to June 30, 1952, was $9,797,908.86, and the taxes paid for the period July 1, 1952, to June 30, 1953, were $8,120,854.17."

For the second consecutive year, Leon H. Strecker, outside foreman, Alaska Colliery (left) of The Philadelphia & Reading Coal & Iron Co., Pottsville, Pa., was honored by the Joseph A. Holmes Safety Association with its Certificate of Honor "for supervising the surface employes of Alaska Colliery from July 14, 1948, to October 3, 1952, a total of 458,588 man-hours with no lost-time accident." Presentation was made by J. J. Forbes, of the U. S. Bureau of Mines, Washington, D. C., at ceremonies last August 8, 1953, when the company played host to some 1500 employes and friends at Lakewood Park Pavilion for its annual First Aid Contest.

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Organize Technical Meetings

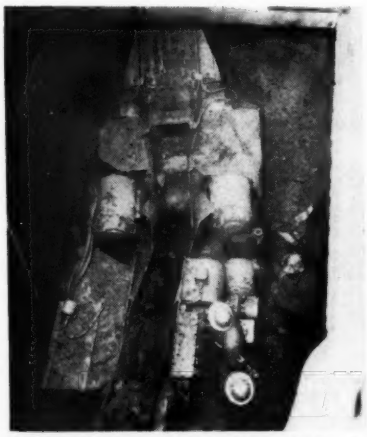
A full program of activity for the Pennsylvania-Anthracite Section, AIME, has been outlined by the organization's executive committee and newly elected chairman, Edward G. Fox, president of the Philadelphia and Reading Coal and Iron Co.

Ralph A. Lambert, president of the Pennsylvania Coal Co., was appointed chairman of the society's regular Fall meeting which will be held October 28 at Scranton.

George Holland was appointed chairman for the Spring meeting which will be held at Hazleton, and George J. Clark, general manager of the Philadelphia and Reading Coal and Iron Co., was appointed chairman for the society's annual meeting to be held during the 1954 industry vacation period at Pottsville.

Continuous Coal-Mining Machine Solves Tunneling Problem

THAT familiar old adage of "silence is golden" holds extra for officials of the City of Euclid, Ohio, who had been hounded and harrassed by irate residents complaining about damage to their homes and the noisy operation of constructing a storm sewer tunnel in the community.



Coal mining machine drives 20 ft of storm sewer per shift in Northern Ohio

So great was the public clamor raised, in fact, that the city halted work on the project back in January shortly after its inception.

The ruckus started when National Construction Co. of Cleveland began boring a tunnel for a storm sewer at Lloyd Road and Lake Shore Boulevard in Euclid. Almost immediately Euclid officials were swamped by a flood of complaints from nearby residents in the area that the dynamite blasting and digging operations were "cracking" their homes.

Work was halted in no time at all—and there it remained, at a complete stand-still. Then someone clipped a leaf from the experience book of the bituminous coal mining industry, they decided to use a continuous mining machine.

Replacing the former practice of dynamite blasting, the machine is fully living up to its name, according to officials of both the construction firm and the City of Euclid. Boring its way some 30-ft underground as it continuously cuts and bites the medium-hard shale in big chunks, the unit is grinding out a 12-ft hole through which the area's storm waters are expected to flow before many months are gone. The mechanical "tunneler" is presently digging at the rate of 20-ft and better per 8-hour day.

Move General Sales Office

Earl C. Robertson, vice-president in charge of sales for the Pocahontas Fuel Co. has announced the removal of his office and the general sales office from New York to the Terminal Tower, Cleveland. The move was made September 1.

At the same time Arthur J. MacBride, assistant vice-president of sales, also moved to Cleveland although he will retain an office in New York. The office of Hoyt W. Capps, western sales manager was moved from Detroit to Cleveland.

In announcing the transfer of the Western sales manager to the new Cleveland office, Robertson said the Cleveland district sales office will occupy space with the general sales office. The Baltimore, Bluefield, Chicago, Cincinnati, Detroit and Richmond district offices will remain in their present locations.

Plan Locomotive School

A school for 70- and 95-ton diesel-electric locomotives will be conducted by the Locomotive and Car Equipment Department of the General Electric Co. in Erie, Pa., from October 5 through 9.

Instruction will be concentrated in three areas: (1) principles of operation; (2) fundamentals of equipment and trouble-shooting, and (3) better maintenance practices.

Factory and classroom demonstrations will supplement the classroom work to provide a better understanding of the principles that are presented, according to O. W. Hazleton, school instructor.

Two days of the week will be spent at the Cooper-Bessemer Corp. in Grove City, Pa., where the class will receive instruction on the diesel engine.

Some 20 students representing the steel and chemical industries, small railroads and mines are expected to attend the session, Hazleton said.

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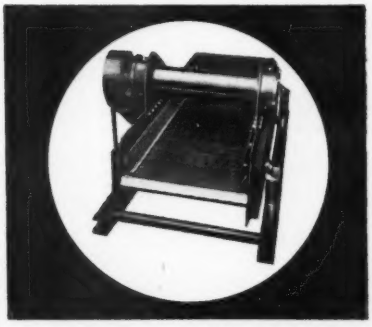

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Honor Old Workers

The Old Timers of the Lehigh Navigation Coal Co., Lansford, Pa., were feted by company top "brass" on August 8.

It was the eleventh annual meeting of the Old Timers, who restrict their membership to mine workers who have been in the employ of the Old Company for at least 50 years. They've often been called "The Most Exclusive Club in the World."

Twenty-seven men who this year reached the half-century mark of service were welcomed as "recruits" to the ranks of the Old Timers. They were presented with the bull's-eye lapel pin which is the identification badge of the club.

William W. Bobst, of Allentown, who is 90 years old, was champion oldster in attendance. He has a record of employment with the Old Company that is probably unequalled by any other firm in the world—80 years. He worked 68 years before retiring, and has been on the company's pension rolls these past 12 years. With him was a son, Richard, 69, an Old Timer of 52 years' service.

There was good food aplenty. Shortly after noon, the top "brass" of the company, led by president Glenn O. Kidd, donned chefs' caps and aprons to serve hot platters of turkey and beef to the more than 200 veterans who ranged alongside the picnic tables.

There was a special orchid for Harry Shires, who is the oldest member in point of active service. Harry is still spry and alert at 81, and grumbled good humoredly that he never should have accepted a pension after having worked 69 years for Old Company. "I'm still as good as I ever was," he claimed.

Father-and-son Old Timers, both now retired, chat with Glenn O. Kidd during the picnic. William W. Bobst, center, worked 68 of his 90 years for the Old Company, has been on pension since 1941, for a total employment of 80 years. His son Richard, left, is 69, and has 52 years of service.

Award New Scholarship

William Laffoon, Madisonville, Ky., has been awarded the Stanley D. Petter scholarship. The scholarship of $250 per annum was offered in April, 1953, and is administered by the Western Kentucky Mining Institute. The only stipulations are that the recipient reside in the Western Kentucky Coal Field, and that the money be used for the matriculation or continuance of a course of study for an engineering degree at the University of Kentucky. Stanley D. Petter, founder of the scholarship, lives at Faducah, Ky.

Gorgas Closes

After burning more than 6000 tons of coal at the Gorgas underground gasification project near Birmingham, Ala., the experiment was abandoned June 20. The project had attracted international attention and was studied by many distinguished scientists from here and abroad.

L. M. Smith, president of Alabama Power Co., which conducted the experiment in cooperation with the U. S. Bureau of Mines, said, "The way we look at it, the Gorgas project has taught us a lot of things about underground burning of coal to create gas. It is not a life and death proposition and can be resumed at any time. Similar experiments are being made elsewhere."

The burning coal was extinguished by pouring water into the same holes through which the nitrogen bombs, which started the burning were dropped.

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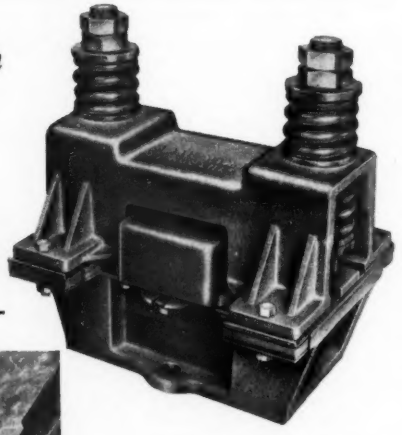

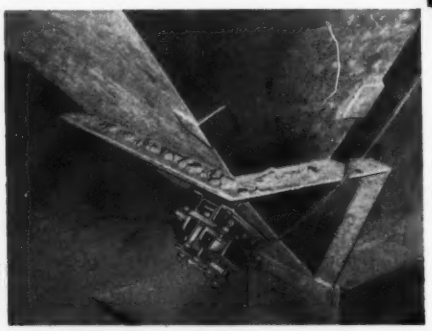

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Tractor Testing Grounds

International Harvester Co. has completed arrangements with the Huntsville-Sinclair Mining Co. under which Harvester will occupy as a testing ground the site of the Huntsville-Sinclair strip coal mine, eight miles northeast of Huntsville, Mo., for the purpose of carrying on large-scale testing operations of Harvester machines.

The announcement was made by H. T. Reishus of Chicago, vice-president of the company's industrial-power division. Reishus said the property, to be leased for a term of 10 years, would provide approximately 9300 acres of worked-over strip-mine lands on which the company's crawler tractors and other construction machinery will be tested in leveling and other earth-moving operations.

The coal company suspended strip-mining near Huntsville, moving those operations to the Bee-veer mine near Bevier, Mo., and transferring loading operations to the vicinity of Excello, Mo.

Of perhaps equal or greater long-range importance is the International Harvester announcement that, as a byproduct of the testing, the company hopes to restore to something approximating its original contour more than 9000 acres of the worked-out strip-mining territory.

Coal Town Hard Hit

A carefully planned, determined effort to attract industry to Mahanoy City, Pa., has been launched by a small group of local business men. Main appeal of the campaign is an available labor pool of 4500 (90 percent male) workers who are ready and willing to learn new jobs to bring steady employment back to this community which has been particularly hard hit by the closing of two large anthracite collieries.

After several years of sporadic, though well-intentioned, effort to bring in new industries to take up the employment slack of mass lay-offs occasioned by closing of two collieries, idling almost 2000 men, the original loosely-knit community development group was reorganized and a smaller committee formed of business and industrial leaders representing the broad side of Mahanoy City interests.

Denying that "the coal regions are dead" and the misconception some people have that miners and other workers in this area are habitual strikers and trouble-makers," the committee points out that the announcement of plans produced a spontaneous outburst of community solidarity and pledges of practical cooperation with the campaign, including written commitments by presidents of all local labor unions that they would personally guarantee the productivity of their members under fair working conditions, if the committee could bring in new plants to create badly needed new jobs.

The committee president declared that, contrary to popular belief, labor relations on the whole in the area had been unusually harmonious for years. In Mahanoy City and environs, the president stated, the last serious labor disturbance was in 1926 and the region has been singularly free from strikes except those called on a national basis, "which our men did not start and could not prevent."

See Greater Coal Use

Coal's importance to the national economy—past and future—is given emphasis in a study published by the Population Reference Bureau, Inc., and reviewed by the Bituminous Coal Institute. The bureau is a nonprofit organization that specializes in gathering, correlating, and distributing population data.

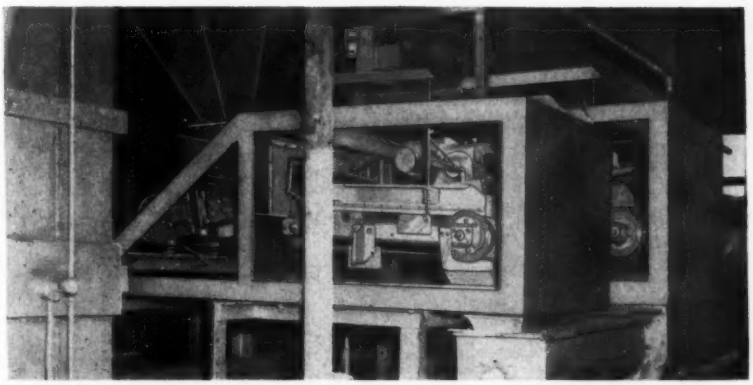
Estimating that bituminous coal's current rate of consumption will be doubled during the next 25 years, the report—edited by Robert C. Cook, director of PRB—explains that the appraisal is confined to the use of coal as a source of energy and does not include potential consumption in the event that coal is "more widely used than it is now" as a major raw material for the chemical industry.

The demand for coal will rise to 800,000,000 tons per year by 1975, according to PRB, which also points out that "when petroleum begins to run out," coal can furnish the basis for synthetic liquid and gaseous fuels.

PRB's prediction of an 800,000,000-ton level in coal demand by 1975 conforms with results of a number of studies conducted by both government and private industry, although some fuel experts believe that the nation's annual coal requirements at that time will be in excess of a billion tons.

Canadian-Cliffs, Ltd.

A company official of the Cleveland-Cliffs Iron Co., recently reported that, "Canadian-Cliffs Limited, a wholly owned subsidiary of Cleveland-Cliffs, with headquarters in Cleveland, Ohio, is continuing a broad program of exploration in Canada. This program was instituted in 1952 and is expected to continue, and probably expand, in the future. The company is primarily concerned with iron ore and related ferro alloy minerals. The program is being conducted in Ontario, Quebec, and the Maritimes on Crown lands and lands personally held by individuals and exploration companies."



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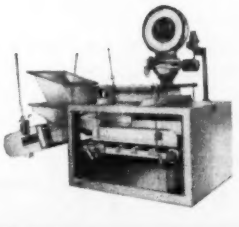

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Coal Pipe Lines for England

The National Coal Board in England is studying the practicability of transporting coal by pipe line from the coal fields to power stations. One of the plans being examined would call for a 100-mile-long pipe line through which coal would be pumped in a stream of water from the Midlands coal fields directly to London.

At the present time the Coal Board is thinking in terms of piping 1,000,000 tons of coal a year.

Geophysical Prospecting

(Continued from page 31)

Such prospects are usually located by exploration engineers and geologists and then presented for consideration either for direct prospecting or for geophysical study.

If there are logs of old drilling available, the start of an electrical survey should always begin in their immediate vicinity. If churn drill holes are available, electrical logging of these should also be considered.

Aid Search for Water

Extensive application of electrical geophysics has been made to water problems. In the southwest, especially, water supply is frequently an important problem in connection with mining, and geophysical methods have been employed in water studies for several years. As in the application of geophysics to mineralization, it is desirable to start a survey near an existing well to determine electric characteristics of the gravel and relative gravel water conductivity. It is also important to obtain water samples from the area under survey and determine their unit conductivity or resistance.

Almost all such surveys have to do with underground water supplies in gravel, although occasionally the possibility of deriving significant water in fault zones comes up. Resistivity is the most extensively employed method for water studies. There are two answers to be expected from such surveys; first the depth to the top of the water table; and second, the area of greatest permeability. The latter, of course, is the most important since it points to the area or areas which will yield the highest rate of pumping. Unfortunately it does not necessarily mean that such areas will make a commercial well, but it usually points out the most promising section in a given area. All in all, geophysics applied to water prospecting has been moderately successful.

Conclusion

We believe geophysics has its place in exploration and prospecting, and in the future will find greater use in finding ore bodies or mineralized areas and delineating them. Present geophysical methods we know are inadequate for the job but with well financed research programs much improvement can be expected in the coming years. Most research programs of those mining companies already in the field have centered on only one, or possibly two, electrical methods. We do not yet know that any one method is preferable to another under all geologic conditions. At present, interpretation and depth resolving power are the weakest points.

Under some circumstances we are able to form a rough estimate of the degree of mineralization and in the future we hope for considerable improvement in this phase. Do not expect any sudden emergence of a new method that would answer all of the prospector's problems. They are formidable ones, and their study involves the geophysicist, mathematician, physicist, engineer and geologist.

Wheels of Government

(Continued from page 52)

There is strong sentiment in Congress for revising the Social Security system, particularly to place it on more of a pay-as-we-go basis, and it is likely that some action in this direction will be taken next year.

Coal Mine Safety Progress

A report covering the first year of operation under the Federal Coal Mine Safety Act has been made by the U. S. Bureau of Mines.

The report says that since July, 1952, some 10,428 inspections of mines subject to the Act's provisions were made, and that in this period 109 withdrawal orders, affecting 53 mines, were issued. It stated that 38 of the orders were annulled after reinspections had been made and the dangers eliminated. Besides the withdrawal orders the Bureau issued 49 orders classifying mines as gassy, three of which were appealed to the Secretary of Interior, who annulled one and upheld two.

Federal inspections, according to the report, found 7540 violations of the safety provisions of the Act, but nearly half of these were corrected immediately. Government inspectors issued 3990 notices granting a reasonable time for eliminating dangers, 1592 granting an extension of time, and 3669 certifying that violations had been totally abated. Only one mine disaster occurred during the year.

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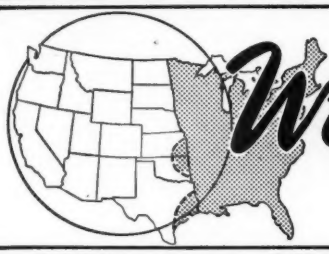

Western States

Utah Mine Program

Chief Consolidated Mining Co. plans to spend over $1,000,000 in development work at the Chief No. 1 mine, Eureka district, Utah, during the next three years. To help finance this program the company has obtained a loan of one-fourth the estimated cost from DMPA. This is to be repaid out of profits from ore sales.

Officials of the concern report that development work will cover some eight projects, involving 22,000 ft of drifting and cross cutting, and 40,000 ft of diamond drilling. It was further emphasized that the entire program is dependent upon a revival of lead-zinc prices. While work is under way, suspension of the program could occur if economic factors become any more unfavorable.

Main portion of the work will be carried out in two projects at the north end of the Chief No. 1 mine on and below the 2700-ft level. This includes development of ore bodies that may extend to the 3100-ft level. Many improvements, looking toward greater efficiency in handling ore, have been made in recent years. These include installation of a new hoist and completion of new pump batteries capable of moving water at the rate of 14,000 gpm.

Old Soldier Mine

Richard Taylor, who has a lease on the Old Soldier mine, a gold-silver property in California Gulch, five miles south of Ruby, Ariz., expects to start production and shipment of siliceous silver ores soon. Four men are now employed in the operations.

Describe 200-Ft Coal Bed

Large reserves of coal suitable for strip mining in a bed locally more than 200 ft thick near Lake De Smet, Johnson County, Wyo., are described in a new report of the Geological Survey.

The thick coal, which covers an area of 2½ sq miles on the west side of Lake De Smet, and which is less than 100 ft below the surface over a considerable part of the area, was discovered by drilling undertaken to investigate a proposed reservoir and dam site. Together with thinner parts of the bed exposed east of Lake De Smet, it is estimated to contain about 528,000,000 tons of coal, of which approximately 35,000,000 tons has been accurately measured by drilling. The coal is of subbituminous rank and contains 5 to 9 percent ash, and 0.5 to 1 percent sulphur.

The report, "A thick coal bed near Lake De Smet, Johnson County, Wyo.," —Part 1 by William J. Mapel, "Geology of the area"; and Part 2 by James M. Schopf and James R. Gill, "Descriptive and analytic characteristics of coal in De Smet drill cores"—has been published as Circular 228 of the Geological Survey. Copies may be obtained without charge upon application to the Chief of Distribution, Geological Survey, Washington 25, D. C.

Ore Purchase Program

The government's manganese sampling and purchasing depot at Wenden, Ariz., is currently taking 44 truckloads of ore daily, according to an official of Emergency Procurement Service. The depot recently received over 15,000 tons of manganese ore in about a month of operation.

Robert E. Reno, Jr., deputy regional director, said that from the experience of the first 41 days of operation it is estimated that 1,250,000 units of manganese will be acquired during the first year of operation. At that rate, it would take four years to reach the 6,000,000-long-ton limit set for the Wenden depot. The program will end when that tonnage is reached or on June 30, 1956, whichever occurs first.

Develop Nevada Iron Ore

Dodge Construction Co. of Nevada has reportedly leased a large group of claims in the Humboldt Range, 12 miles southeast of Lovelock, Nev. Dodge has stripped overburden from a large area on one ridge, drilled test holes, and shipped a test lot of ore.

During 1952 Dodge developed the open pit Heizer-Sagerstrom iron mine in Churchill County, Nev.

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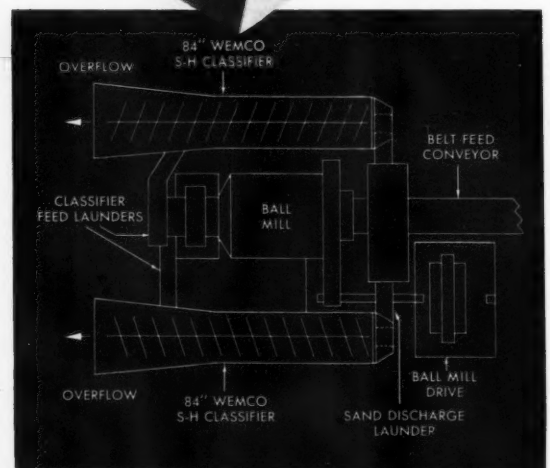
WHITE PINE COPPER PROJECT

One of 12 Wemco S-H Classifiers soon to be installed for White Pine Copper Co. at White Pine, Michigan. All mining and processing operations for this large project were designed and engineered by the Western-Knapp Engineering Co., division of Wemco.

With expected annual production of 75 million pounds, White Pine ranks as one of the most important copper projects now being developed. To serve as a vital part of the primary grinding circuit, White Pine selected twelve 84" Wemco S-H Classifiers. Typical of the magnitude of this project is the fact that these 84" units, now under construction, are the world's largest simplex classifiers.



- As shown in the accompanying diagram, two Wemco S-H Classifiers will be operated in closed circuit with each of six ball mills, 12' 6" x 13' in size. The minerals to be produced are chalcocite and minor amounts of native copper occurring in sandstone and shale deposits. Each classifier is of the submerged spiral type of design with 84" double ribbon, variable pitch spiral. Inside tank length totals 41' 9". Operating slope is 3½" per foot.

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Another Plant for Anaconda

Anaconda Copper Mining Co. recently has announced plans to construct a new aluminum rod and wire mill at the company's Great Falls, Mont., plant. It is reported that the plant would be built to process wire and rods from aluminum ingots produced at the Columbia Falls aluminum plant now under construction.

Tunnel at Halfway Mark

Work on the 8500-ft tunnel which Sullivan Mining Co. is driving from the Hecla plant at Burke, Idaho, to intersect main Star shaft on the 2000-ft level has reached the halfway mark. The 10-ft by 11-ft bore is being driven mostly from the Hecla plant, though some work is being done from the Star 2000-ft level. Three shifts are working six days a week on the undertaking and progress has been about 21 ft daily, according to Ralph W. Neyman, general manager of the Hecla Mining Co., which, with Bunker Hill and Sullivan Mining and Concentrating Co., is joint owner of Sullivan.

The project is expected to be completed about the first of next year. The undertaking has several important aims. It will (1) improve ventilation, (2) eliminate hoisting in the Hecla shaft, (3) eliminate pumping of 100,000,000 gal of water yearly from the Hecla, (4) enable men to get to the working faces of the mine quicker, (5) allow installation of a primary crusher underground, together with automatic loading facilities, and (6) carry a 13,200-v cable to underground machinery.

The new tunnel, by decreasing operating costs, should add a considerable tonnage of marginal ore, not presently minable at a profit, to ore reserves.

Vanadium Corp to Expand U-Ore Plant

Permission has been granted by the Atomic Energy Commission to the Vanadium Corporation of America to install at its Naturita (Colo.) mill a roaster for processing vanadium-uranium ores mined from its own properties and purchased from many independent producers. This and auxiliary facilities now being built should be in production during the fall.

The company has also exercised its option to purchase the mill at Durango, Colo., which will process vanadium-uranium ores. The company has operated the plant under lease from the AEC for the past five years.

Central Eureka Plans Boost

The Central Eureka Corp., leading gold producer on the Mother Lode of California, is planning to increase operations. A consulting engineering firm has been engaged to study the best method of raising ore production to 350 tpd. Present capacity of the mill is 150 tpd.

Ore bodies have been developed to a depth of 4200 ft and large reserves are reported available for future mining. The Central Eureka mine at Sutter Creek has been idle several weeks while reconstruction of the Central Eureka and Old Eureka shafts proceeds. Caving ground damaged part of the workings last year, forcing a shutdown of three months.

Begin Gold Hill Production

Production at the Arizona Girl and Little Annie properties in the Gold Hill district near Ruby, Ariz., will start upon completion of road construction to the sites, according to J. L. Watts and associates, C. L. Jernigan and Walter Botts. Machinery and equipment have been moved to the site and 200 ft of new tunneling completed. Ore content is principally lead and silver, but considerable gold also is indicated. Ore is shipped to Hawley & Hawley, Douglas ore buyers.

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Hypotheek Findings Good

The Board of Directors of the Hypotheek Mining and Milling Co. have announced plans to unwater the company's shaft in the Pine Creek area of Idaho. These plans were made as a result of encouraging findings in current diamond drilling on the property. Diamond drilling has proved the downward extension of the vein in which the company has been mining.

After unwatering the shaft, the Board of Directors said, the face of the 300 level will be examined to determine whether the ore showing warrants the starting of production by raising on ore and following it up toward the ore in the surface tunnel.

When future conditions permit, the company also wants to resume development on its 1100 level at West Hypotheek. Exploration on the 900 shaft level indicates the 1100 level could be brought into production at comparatively small cost.

Issue New Publications Index

The Colorado School of Mines has revised and published a new index to cover all its publications. Announcement of the printing of the 89-page book was made by LeRoy W. Goodwin, director of the department of publications.

The index is of particular value since it lists publications that are out of print and can be viewed only in the "Mines" library as well as books available for distribution.

Included is a lengthy listing, by subject, of the mineral industry topics covered in the college's Quarterly and in independent "Mines" publications. There is also an index of authors and a listing of theses titles covering the years since 1896.

In addition, the college has compiled a listing of only those publications which are available for sale. Interested persons can obtain either the complete index or this specialized listing free of charge by writing the Department of Publications at the Colorado School of Mines, Golden, Colo.

Release Radioactivity Maps

Photomosaic maps showing airborne radioactivity anomalies in the Tabernacle Buttes, West Lonetree and Aspen Mountain areas, Sublette, Fremont, Uinta and Sweetwater Counties, Wyo., have been released by Secretary of the Interior Douglas McKay.

The anomalies represent areas of unusually high radioactivity as observed from the air and may or may not indicate the presence of uranium on the ground.

The work in Wyoming was part of a program of airborne reconnaissance for uranium-bearing ore bodies being conducted throughout the United States by the Geological Survey on behalf of the United States Atomic Energy Commission.

The maps showing the location of the radioactive areas are available for public inspection at the following Geological Survey offices: Room 1033, Library, GSA Bldg., Washington, D. C.; Room 468, New Customhouse, Denver, Colo.; Grand Junction, Colo.; Room 100, Old Mint Bldg., San Francisco, Calif.; 504 Federal Bldg., Salt Lake City, Utah; Custer, S. D.; Federal Bldg., Casper, Wyo.; Sheridan, Wyo., and Science Hall, University of Wyoming, Laramie.

They will also be available for inspection at the Bureau of Mines office, Rapid City, S. D., and at the following offices of the United States Atomic Energy Commission: New York Raw Materials Office, New York, N. Y.; Denver Exploration Branch, Denver Federal Center, Denver, Colo.; Hot Springs Suboffice, Hot Springs, S. D.; Grand Junction Operations Office, Grand Junction, Colo.; Grants Suboffice, Grants, N. M.; Salt Lake Exploration Branch, Salt Lake City, Utah; Richfield Suboffice, Richfield, Utah, and the Butte Suboffice, Butte, Mont.

These radioactivity maps will be made available at the Geological Survey offices in Casper and Laramie, Wyo., and Grand Junction, Colo., for reproduction by those interested in obtaining copies.

Firedamp Control

(Continued from page 49)

study of firedamp emission before any drainage scheme is brought into operation at the large Dutch mines. There is wide scope for related measurements underground such as observations of strata movement including bed separation. Fundamental laboratory work on coal as an absorption medium will also call for similar work on coal actually in the seam, to determine absorption conditions before disturbances arise from mining. Until a general pattern of data along these lines is assembled, it will be impossible to set out a logical and practical scheme for full exploitation, which will continue to depend on the extensive experience of practical mining men. Forward planning and development would be greatly advanced if it were possible to introduce reliable and acceptable instruments for record of all quantities observed underground. The development of such instruments is now being recognized as an important step in developing the technique, and forms a major proportion of the work carried out in the laboratories of the industry to further the application of firedamp drainage.

Montana Mine Development

Extensive development is under way at the Montana mine, 31 miles northwest of Nogales, Ariz., formerly an Eagle-Picher Co. property, and at the adjacent Rubiana, Miller-Hanson and Brick groups of claims, all owned by Hugo W. Miller. The program includes construction of access roads and stripping of veins preparatory to sinking a shaft on the Hanson group. Access roads are also being constructed to various sites on the several claims, prior to diamond drilling for location of new ores. Ray Rucker is in charge of the road work for Hugo Miller. The Montana mine, which Miller acquired from Eagle-Picher, and the adjoining claims cover several hundred acres and include three natural lakes.

Rico Argentine

Rico Argentine Mining Co. has applied for listing on the American Stock Exchange in view of its attracting wider attention in recent years and now has some 700 stockholders, according to James E. Hogle, chairman of the board of directors of the company.

At its mines at Rico, Colo., the firm has continued a two-fold exploration and development program. These include developments on "J" and "L" beds in the Wellington mine. A second project is the rehabilitation of the St. Louis tunnel, now in 5300 ft. Some 3500 ft of additional tunneling will be carried out in an area in which ore has been indicated by diamond drilling. Extension of the St. Louis tunnel will add some 250 ft to the working depth of the mine. Rico now mines 150 tons of lead-silver-zinc ore daily.

Start Work Tunnel

The Garnet Tungsten Mining Co. reports its exploration tunnel is in 350 ft at the Knowles-Montrose property near Mountain City, Nev. A work tunnel has been started. The firm also has a contract with the Galigher Co., Salt Lake City, for construction of a 150-ton concentrator on its properties.

Test Manganese Concentration

Preliminary tests to determine how seven low-grade manganese ores from California, Nevada, and Mexico respond to simple methods of concentration are described in a Bureau of Mines report released by Secretary of the Interior Douglas McKay.

Two of the samples tested were from Humboldt County, Nev., and one each was from Lincoln County, Nev., Riverside County, Calif., Humboldt County, Calif., Plumas County, Calif., and Lower California, Mexico. They contained from 11 to 33 percent manganese. The treatment methods tried included gravity concentration, flotation, and magnetic separation. Recoveries of 52 to 80 percent of the manganese were obtained from five of the ores, with the highest grade concentrate containing 41 percent manganese. Efforts to concentrate two of the ores failed.

A free copy of Report of Investigations 4985, "Concentration Tests of Manganese Ores," can be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa. It should be identified by number and title.

Working At Weber Mine

New Rainbow Mining Co. has resumed work at the old Weber Mine near Lakeview, Idaho. Initial objective will be to complete re-opening of the main tunnel. When work was interrupted in February by the death of George H. Austin of Spokane, company president, the tunnel had been opened for about 900 ft. Miners had just about completed tunneling around a large cave-in, which had defied their efforts to retimber.

Dedicate Matchless Mine Cabin

The cabin at the Matchless mine at Leadville, Colo., occupied by Baby Doe Tabor during 36 years of poverty preceding her death, was dedicated as a historical monument recently by the Leadville Assembly, Inc., a historical society. Baby Doe was the wife of H. A. W. Tabor, a legendary figure of Colorado's early mining days.

Develop Tungsten Site in Utah

A tungsten mining property is the scene of considerable activity near Beaver, Utah, as a group of Nevada mining men are constructing a concentrating mill at the mouth of Pass Road, 10 miles northwest of Beaver. The tungsten property located in the Mineral Range has been leased to the Blue Star Mining Co.

Total value of the mill upon its completion will be about $50,000 and capacity will range between 40 and 60 tpd. Power will be furnished by the Telluride Power Co., and transformers have already been installed. The company has a three-year agreement with the Government, which will purchase all the concentrate the mill can produce.

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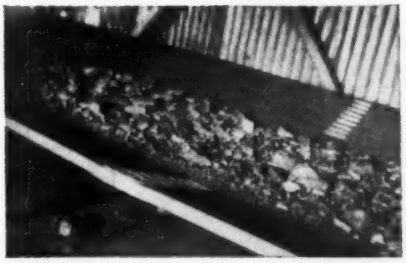

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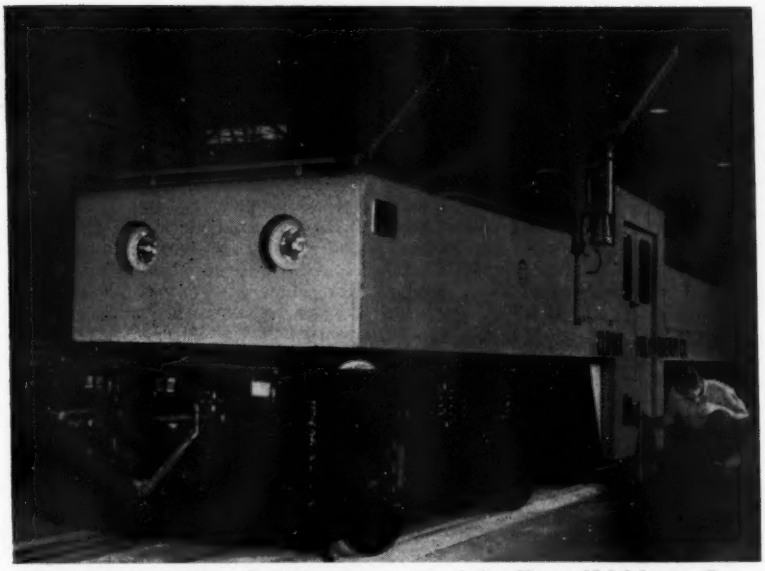
Locomotive for Climax Molybdenum



To overcome clearance limitations in a mine of the Climax Molybdenum Co., the General Electric Co. designed this locomotive with an over-all height of only six ft, eight in. This new all-electric locomotive, which will be used in the Climax, Colo., mines at an altitude of more than 11,000 ft above sea level, will do hauling in connection with the new mining project to develop a body of low-grade molybdenum ore. To meet the low mine clearance and still provide comfort for the operator, G-E engineers employed a drop-center cab which clears the rails by only eight in. The locomotive is one of seven being made for Climax, the largest domestic producer of molybdenum.

Whitedelf Strikes Ore

Compton I. White, Jr., president and manager of the Whitedelf Mining and Development Co., has reported that a second ore strike has been made on the new 800-ft level of the Whitedelf Mine near Clark Fork, Idaho. The strike indicates a new ore body, as White reports that no ore was found in this section of the vein on the 400-ft level above.

Ore bins are full of development ore, he said, and the Whitedelf mill is being overhauled preparatory to a mill-run of about 200 tons. The 800-level drift is being continued through the fault. A cross-cut will then be driven about 600 ft to the projected position of the main ore body in the Pearl vein, north of the fault, White reported.

Progress In Oregon

According to the Raw Materials Survey News Letter, Oregon's three newest electro-metallurgical plants—the M. A. Hanna ferronickel reduction works at Riddle, the National Metallurgical Corp. (Apex Smelting Co. and American Smelting and Refining Co.) aluminum-silicon alloy plant at Springfield, and the Harvey Machine Co. aluminum reduction plant at The Dalles are rising on schedule.

Foundations are being poured and ore handling facilities installed at Hanna's site near Nickel Mountain. At the National Metallurgical aluminum alloy plant going up at Springfield, foundations are also being poured and plant and machinery assembled. A search is under way by company geologists for additional local clay deposits suitable for direct electric furnace smelting.

A building has been erected to house engineering survey crews at the Harvey Machine Co. property near The Dalles.

Develop Inyo County Mine

The Fowler Mining Corp. is developing its mine in Inyo County, Calif. The property is in the White Mountains district near the Nevada line. A tunnel is being driven below a silver-lead-zinc ore body discovered on an upper level.

Copper Mine Wins Award

The Joseph N. Holmes Safety Certificate of Honor has been awarded the 2500 employes of the open pit Bingham mine of the Utah Copper Division of the Kennecott Copper Corp. They won the award for having operated 21 months without a fatal accident. During that period, the employes piled up 10,189,688 man-hours of work.

Ship First Concentrates

The first load of concentrates from the Silver Shield mill of the Colvin Mining and Milling Co. at Ouray, Colo., has been shipped to the Leadville smelter. Tom J. Colvin, president, said the truckload included seven and one-half tons of lead, zinc, silver and gold concentrates from the mine in Yankee Boy Basin, 11 miles northwest of the mill. About 18 men are employed in the mining operation and five in the mill.

Brothers Build U-Ore Mill

Two North Dakota brothers are establishing a processing mill at Yellowknife, on the shores of Great Slave Lake, Canada, for the treatment of uranium produced from their claims in that area. The Ridley Mines Holding Co., headed by Charles and Arthur Ridley of Maida, N. D., and financed by North Dakota capital, claims to have 12 major veins of high-quality uranium in its 2200-acre holdings on the lake. Ore produced so far has been stockpiled pending construction of the mill to concentrate it for marketing purposes.

Easton-Pacific Group

Plans have been announced by the Grizzly Gold Mining Co. to develop the Easton-Pacific group of 19 patented and six unpatented claims at Virginia City, Mont. The properties, formerly leased to the U. S. Grant Mining Co., are lead-silver producers. The Grant firm put a 4500-ft tunnel into the property and opened two veins, according to Joseph Butzerin, Spokane, Wash., one of the incorporators of Grizzly Gold. One of the veins was developed for an estimated 280,000 tons of reserves with 80,000 tons broken and ready for milling.

Grizzly Gold plans to set up a mill of at least 100 tpd capacity. Financing is under way with a stock offering planned to U. S. Grant stockholders and former stockholders. Some $2,000,000 in ore was taken from the property prior to 1913.

Pick Up Durango Option

Vanadium Corp. of America has obtained approval of the Atomic Energy Commission to install a roaster for processing vanadium-uranium ores mined from its properties and purchased from many independent producers. The roaster will be installed at its Naturita, Colo., mill.

The company also has exercised its option to purchase the mill at Durango, Colo., which also processes vanadium-uranium ores. The company has operated the mill under lease for the past five years from the Atomic Energy Commission.

Uranium Search Continues

A quiet search continues throughout the free world for uranium and other radioactive minerals, according to the recently published Fourteenth Semi-Annual Report to Congress of the Atomic Energy Commission. The report revealed that the North American continent and the United States itself have far greater natural resources in uranium than earlier studies had led experts to believe.

The Colorado Plateau area, embracing parts of Colorado, Utah, New Mexico, and Arizona, continued to be the principal domestic source of uranium during the first six months of 1953, the period covered by the report. Other areas of domestic production of uranium ore were the Black Hills area of South Dakota and Wyoming, Boulder Batholith area of Montana, and the Colorado Front Range. The most important of these is the Black Hills area.

The report also pointed out that recent discoveries of new ore occurrences in Arizona have resulted in "increasing prospecting and exploration activity throughout that state." Some ore has been produced there also. The Marysvale, Utah, area was the principal source of primary-vein type of uranium ore production.

Other ores came from foreign sources, principally the Belgian Congo, Canada, and the gold fields of the Rand in South Africa. A plant in Australia for treatment of first production of uranium in that country will be completed early in 1954, the report said.

It was noted that construction of the new ore-processing mill near Grants, N. M., by the Anaconda Copper Mining Co. is nearing completion and that the plant is expected to be in operation this fall. The plant will bring to nine the total number of uranium ore-processing mills on the Colorado Plateau. New mills are also being planned at Shiprock, N. M., by Kerr-McGee Oil Industries, Inc., and at Hite, Utah, by the Vanadium Corp. of America. It was further noted that Anaconda is considering building additional facilities at Grants to handle sandstone-type ores which cannot be handled by the facilities presently being constructed.

Another source of domestic uranium to which the report referred is the phosphate rock industry. A minor quantity of this year's production has come as a uranium by-product from the treatment of phosphate rock by the Blockson Chemical Co., at Joliet, Ill. Additional plants for by-product recovery of uranium from phosphate rock are nearing completion at Mulberry, Fla., by International Minerals & Chemical Corp. and the Virginia-Carolina Chemical Corp., and at Texas City, Texas, by Texas City Chemicals, Inc. The completion of these facilities will further augment the production of by-product uranium.

Exploration for uranium in the United States continues at a high level, the report said, with searches being made scientifically with airborne and automobile-borne radiation detectors, by analysis of plant growth, by oil-well drilling companies, and other exploration techniques. The analysis of ash from plants and the examination of growing plants are new exploration techniques which might provide a tipoff on the presence of uranium, the report said.

The airborne radiation surveying program was expanded during the period and was carried on in New Mexico, Utah, Colorado, Wyoming and Pennsylvania. Numerous oil companies are now cooperating in the uranium search and the AEC has a field program under way on the Plateau to determine the effectiveness of geophysical methods in uranium exploration. In this connection, a number of consulting geophysical exploration companies have added radiometric surveying to the services they offer.

The report also spoke of the research and process development efforts in the field of raw materials Particular mention was made of the investigations being made into the potentialities of sources of low-grade uranium such as the phosphate, shales, lignites and fluorspar. Special mention was made of the uraniferous Shale Project, under way by the Bureau of Mines, Geological Survey and the AEC in cooperation with several educational institutions. The program includes an experimental mine to be operated by the Bureau on the Chattanooga shale in Tennessee.

Another research program receiving special comment was the process technology studies under way at a number of pilot plants located at Grand Junction, Colo.; Salt Lake City and Monticello, Utah, and at Grants, N. M., to test and develop recovery processes for various types of ore produced on the Colorado Plateau.

—BOOK REVIEW—

A HISTORY OF PHELPS DODGE, *1834-1950 by Robert Glass Cleland. 307 pp. illustrated. Price $4.00.*

HERE is the biography of one of the great mining companies on the American scene. It presents a clear picture of free enterprise, U. S. style, in action.

Phelps Dodge and Co. started in 1934 as a partnership of Anson Phelps, Daniel James and William E. Dodge. They sold cotton to England. They bought English tin, tinplate, iron and copper. They dealt also in general merchandise like beeswax, pottery, timothy seeds, carpets, moleskins, feathers and spitoons.

The profits from such dealings went into the personal fortunes of the partners and they did not hesitate to risk all in ventures in heavy industries, particularly copper mining and reduction. By 1883 general merchandising had been abandoned and Arizona copper was the chief interest of the partnership. That there was risk is evidenced by the fact that during the years 1881-1886 Phelps Dodge and Co. had run up a debt of $300,000, all attributable to the firm's first copper mining venture. The present eminence of the firm, which did not become a corporation until 1908, proves the vision of the partners, their successors and present-day management of the firm.

Another facet which shines out in this book, one too often overlooked by those critical of large personal fortunes, is the recognition of a sort of "noblesse oblige" for the support of the public welfare. Even in the days when such gifts were not "deductible," the original partners and their successors poured forth large sums in support of schools, colleges, seminaries, churches, hospitals, libraries, etc.

In total, this story is an entertaining, readable account of the growth and development of a great organization plus an insight into a 110-year period during which American enterprise brought our country to the preeminent position it holds in the world today.

TECHNIQUES OF PLANT MAINTENANCE AND ENGINEERING

1953. *Proceedings of the Technical Sessions held by the American Society of Mechanical Engineers and the Society for the Advancement of Management. Published by Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y. 288 pages. $6.00.*

THIS volume includes all the papers given in the Technical Sessions held in concurrence with the Fourth Plant Maintenance Show in Cleveland early in 1953. Each year these technical sessions have produced a rich yield of data about principles and techniques calculated to keep an industrial plant at top operating efficiency.

While few of the papers are concerned in any way with mining, they all contain information which should be useful to the man in charge of maintenance around a mine, mill or smelter. A compressor is a compressor and needs to be maintained, be it in a natural gas plant or a mine.

Manufacturers Forum

Announce Power Saw

Exceptional power, faster cutting, lightweight and low maintenance are among the big features claimed for the new 30-lb, 5.5-hp gasoline chain saw, Model 5-30, announced by Homelite Corp.

Designed for the man who wants power, the new Homelite Model 5-30

Chain Saw reportedly cuts through a 20-in. tree in as little as 20 seconds.

A wide range of blade sizes will be available for the new Model 5-30 Homelite Chain Saw. Straight blades will be available in 18-, 23-, 30-, 34-, 42- and 44-in. sizes. Plunge-Cut Bow Saws, for one- or two-man operation, will be available in 14- and 18-in. sizes. For further information, write Homelite Corp., 111 Riverdale Ave., Port Chester, N. Y.

Scholarships Established

Cleve H. Pomeroy, president of National Malleable and Steel Castings Co., announced recently that the company is establishing $3000 in scholarship funds this year at six educational institutions.

The scholarships are for $500 each at Western Reserve University and Case Institute of Technology, Cleveland; Rose Polytechnic Institute, Terre Haute, Ind.; Carnegie Institute of Technology, Pittsburgh; Purdue University, Lafayette, Ind., and Illinois Institute of Technology, Chicago. They are intended for students in the mechanical, metallurgical, industrial, and chemical engineering fields at the scientific schools, and business administration at Western Reserve.

All selections will be made by the scholarship committees of the schools.

The action is part of National Malleable's program of observing its 85th year in business, the company having been founded in Cleveland in 1868. The scholarships are the first to be arranged by the Foundry Educational Foundation, which is developing a nation-wide educational program on behalf of the foundry industry.

Dump Controls

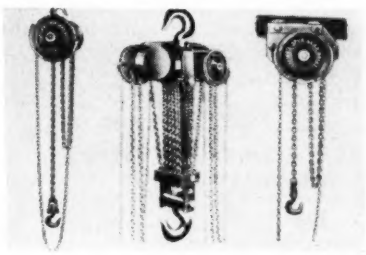
A hydraulic scoop attachment which provides controlled dumping at any desired discharge rate and at any elevation up to the maximum lift height of the truck is now available from the Yale & Towne Manufacturing Co., Yale Materials Handling Division, Philadelphia.

This hydraulic scoop can be quickly attached to or removed from any Yale Fork Truck and provides an easy way of picking up, transporting, and dumping free-flowing bulk materials. Actuated by a double-acting cylinder and wtih truck uprights vertical, it provides a 38° dumping angle down from the horizontal together with a 37° backward angle for handling loads without spillage.

Add to Hoist Line

A total of 55 different models and sizes of Spur Gear Hoists have been added to the Coffing line, according to a recent announcement by the company.

Included among new units are 15



sizes of single- and multiple-chain Spur Gear Hoists with capacities from ¼ to 25 tons. For specialized applications, there now are plain and geared Army-type Hoists, ¼ to 10 tons; Low Headroom Hoists, 1½ to 24 tons; Clevis Connected Hoists, ¼ to 10 tons, and Extended Hand Wheel Hoists from ¼ to 3 tons.

All Purpose Hose

A new, wire-reinforced utility hose, Ironsides Utility Hose, has been developed by Quaker Rubber Corp., division of H. K. Porter Co., Inc., Philadelphia.

Designed especially for multipurpose work, where extreme flexibility and resistance to high pressures is required, the hose can be used as an air hose, oil hose, water hose, gasoline hose, spray hose, and even for hydraulic lines at working pressures as high as 1500 psi.

Made with a nonporous oil-resistant tube, this hose is reinforced with two

separate braids, one of steel wire and one of rayon. The steel-wire braid is grounded to provide a positive conductor for static electricity. The cover is made of thick, tough, oil-proof Neoprene, and is colored bright yellow, so the hose can easily be seen in mines and other dark places.

Available with either high-pressure reattachable or pressed-on hydraulic fittings, it is made in ⅜-in. to 2-in. inside diameter sizes, and costs no more than good-quality, conventional air hose.

For Belt Protection

The mechanical goods division, United States Rubber Co., is adding a tough rubber capping along the edges of conveyor belts used on underground coal equipment to give them longer service life.

Field experience has shown that the edges of the underground belts receive extremely severe punishment in coal mining service. Often belt edges will wear through the rubber cover to the inner belt fabric. When this happens, moisture and fine coal particles enter the fabric and cause rapid belt deterioration. The new capping, used on the U. S. Giant conveyor belts, is an extra layer of rubber of special construction which guards against excessive wear.

Remove Ice

An ice-removing chemical which is reputed to greatly cut the winter cost of cleaning steps, walks, drives, loading docks, and parking lots is announced by the Monroe Co., Inc., Cleveland.

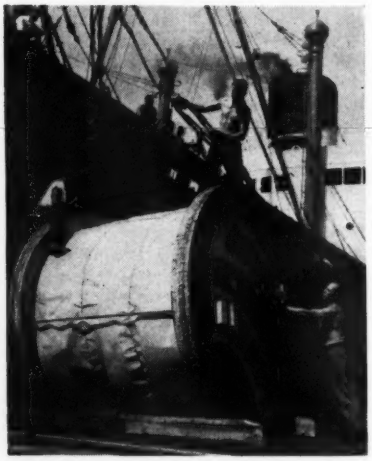
Known as X-73 Ice Remover, the

product is said to melt ice and thaw snow many times faster than salt; and to eliminate ice chipping and greatly reduce the need for snow shoveling. It is also claimed to contain a rust inhibitor which affords protection to automobiles, machinery, drains, and gutters.

X-73 Ice Remover is available in 100- and 200-lb fiber drums and in waterproof paper bags. Write for information to The Monroe Co., Inc., 10703 Quebec Avenue, Cleveland 6, Ohio.

Wire Rope for Reynolds

One of the longest lengths of 1½-in. wire rope ever wound on one reel was shipped from New York recently for use in an unusual bauxite mining



operation of Reynolds Jamaica Mines, Ltd., in romantic Jamaica.

The big reel, nine ft in diameter, contained 15,500 ft of wire rope made at the Williamsport, Pa., plant of Bethlehem Steel Co. It weighed 31 tons. Four other reels, each bearing 14,000 ft of wire rope and weighing nearly 28 tons, are being shipped to the same installation at different times.

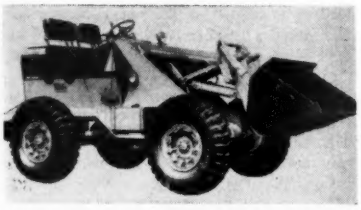
The total shipment of 71,500 ft—nearly 14 miles—of steel rope will become part of the world's largest monocable tramway, extending 6½ miles from the bauxite mine to a shiploading terminal at Ocho Rios, near the exotic Tower Isle resort on Jamaica's north coast. The aerial tramway is required because of terrain too rugged for direct highway or rail transportation.

Moving on an average downgrade from a valley at 1100 ft altitude, the ore is conveyed in carriages spaced at regular intervals on the wire rope, which will be spliced into two separate endless loops on the site.

The bauxite is shipped to Gulf ports for reduction into alumina at plants of Reynolds Metal Co., parent of the mining subsidiary. The scheduled output of the mine is 1,000,000 tons of ore annually.

Develop New Loader

A new front-end Shoveloader with 6000-lb capacity, 4-wheel-drive and power steering, parallelogram loader



action and a 100-in. wheelbase for stability has been announced by Baker-Lull Corp.

Described by the makers as "an excellent unit for jobs requiring high capacity loading under very rugged conditions," the Shoveloader is rated at 1½-cu yd capacity with a recommended working capacity of 6000 lb, and a peak capacity of 9000 lb. Hi-flotation tires and high under-clearance permit efficient operation of the loader under extreme conditions of mud, snow, sand and uneven ground.

Lighter Compressor

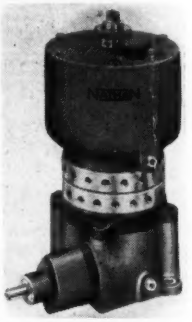
A new 160 cfm portable compressor, to be known as the Super Chief 160, is announced by Davey Compressor Co., Kent, Ohio.

Available in 2-wheel and 4-wheel trailer and in skid mountings, the new unit is reputed to be from 200 to 1000 lb lighter than other compressors of the same capacity.

The Model 160 Super Chief has two low pressure cylinders with 6-in. bore and 3¾-in. stroke; and one high pressure cylinder with 5¼-in. bore and 3¾-in. stroke. It is offered in both gasoline and diesel-powered models.

Solve Lubrication Problems

Nathan Manufacturing Corp., 416 East 106th Street, New York 29, has developed an automatic precision lubrication system called the Lo-Flo Lubricator capable of delivering minute quantities of lubricant to as many as 36 individual points, regardless of the difference in pressures required. It is available in 18 or 36 feed models, with or without group regulation of feeds.



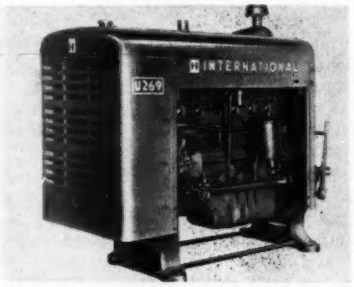
The Nathan Lo-Flo Lubricator is a flexible unit with flow rate per feed ranging from 2.3 cu in. per hr to less than one cu in. per 700 hr, and can use a variety of lubricants from light oils to light grease at 60° F. Outlets can be manifolded internally to increase flow to selected bearings and the unit can be used with separate or integral reservoir.

The Lo-Flo Lubricator is a small compact unit, standing less than 14 in. high, and requires a minimum number of fittings. Full information and specifications are available upon request to Nathan Manufacturing Corp.

Add to Engine Line

With the addition of seven new six-cylinder models, the International Harvester gas-gasoline power unit line now includes 12 engines ranging from 16.5 to 200 net maximum horsepower.

These seven new valve-in-head power units and their horsepower ratings follow: U-1091 (natural gas),



187 net hp @ 1400 rmp, or up to 200 net hp @ 1600 rpm on factory-approved applications; U-450, 102 net hp @ 1800 rpm; U-406, 91 net hp @ 1800 rpm; U-372, 83 net hp @ 1800 rpm; U-269, 62 net hp @ 1800 rpm; U-240, 55 net hp @ 1800 rpm; and the U-220, 50.5 net hp @ 1800 rpm.

Basically, the new U-1091 power unit and the International UD-24 diesel power unit have many common components. Principal differences are

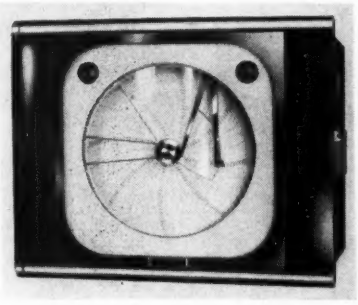
that the UD-24's gasoline starting system and diesel fuel injection system have been eliminated in the new U-1091 power unit.

The six other new models are power units using International motor truck engines. Each has higher speed operations for direct power applications with resultant savings in operating costs.

Program Controller

Bristol Electronic Dynamaster Recording Potentiometers are now available in the form of Time-Temperature Program Controllers, according to an announcement by the Bristol Co.

These new program controllers regulate temperature according to a predetermined schedule of changing values. Any desired program, such as a heating, soaking, and cooling cycle can be accurately maintained. The desired schedule of temperatures is prescribed by the contour of a transparent plastic cam. The same controller can be used to maintain any



number of different temperature programs, since cams of different contour are easily cut and interchanged. The instruments employ an electronic-control system with proportional input action optionally available.

Complete specifications are given in 12-page Bulletin No. P1255, available from the Bristol Co. at Waterbury 20, Conn.

Save File Space

Picturesort Co. of New Haven, Conn. has developed means for easily attaching or removing various length microfilm strips from file or punch cards by use of plastic tracks on the card.

This new way of attaching and removing microfilm strips from file cards for reading in a microfilm reader can be used in many types of Business and Research Records.

Another feature: a Personnel, Medical, Engineering or Business Record Card can now be combined with a plastic sound recording disc in one complete filing unit.

For further detail on Picturesort's "Memory Card File Systems" and Patent Abstract Service, write the company at 246 Church Street, New Haven 10, Conn.

Redesign Hotchkiss Superdip

Ruska Instrument Corp., in cooperation with Professor W. A. Longacre of the Michigan College of Mining and Technology, has redesigned the Hotchkiss Superdip to decreace its weight, simplify its operation and increase its accuracy.

The new instrument may be used either as a total intensity magnetometer. The needle system is temperature compensated and the new unit is lighter and more compact.

Further information may be obtained from the manufacturer: Ruska Instrument Corp., 4607 Montrose Blvd., Houston, Tex.

—ANNOUNCEMENTS—

Charles C. Whaley has retired from active duty with the **Myers-Whaley Co.**

Robert D. Longyear, president of E. J. Longyear Co., announced several changes in personnel at the recent annual stockholders meeting. **Vincent N. Burnhart,** assistant general manager, and **Philip A. Eckes,** treasurer, were elected to the Board of Directors. **Jack F. Stedman** was promoted from chief accountant to office manager.

Appointment of **Paul H. Nast** as manager of the rock drill division, **Davey Compressor Co.,** Kent, Ohio, is announced by Paul H. Davey, president.

Austin Goodyear, general manager of the rubber and conveyors divisions of **Hewitt-Robins Incorporated,** has been elected a vice-president of the company.

At the same time it was announced that **Arthur W. Fasold** has been appointed assistant manager of the commercial research department of Hewitt-Robins Incorporated, with headquarters at the company's executive office in Stamford.

Chain Belt Co. of Milwaukee announces the purchase of **Shafer Bearing Corp.,** Downers Grove, Ill. for the purpose of broadening the markets for its power transmission products. The new addition will operate as the Shafer Bearing Division of Chain Belt Co.

Jason C. McGuire has been named Southern District Representative by **Schroeder Brothers,** Pittsburgh, manufacturers and distributors of mine equipment and supplies. He will handle sales in Southern West Virginia, Eastern Kentucky and Western Virginia.

Before joining Schroeder Brothers, McGuire was an inspector and examiner with the West Virginia Department of Mines, following which he was a salesman for the Mining Division of Kennametal Inc.

Inet, Inc., Los Angeles, Calif., manufacturers of regulated selenium rectifiers has appointed **Bruce H. Atwater,** sales manager.

Atwater was formerly vice-president Sales, Pacific Airmotive Corp., Burbank, Calif.

Euclid Road Machinery Co. announces the appointment of **Melbourne W. "Skip" Miller** as district manager for the following area: Montana, Alberta, Canada, North Dakota and South Dakota exclusive of Fall River, Shannon Custer, Pennington, Lawrence, Meade, Butte, Harding and Perkins Counties.

Martin Meyer has been appointed general sales manager of **Sauerman Bros., Inc.,** Chicago, Ill. He has been assistant sales manager since 1948 and is a director of the company.

Fred O. See, vice-president, **Cardox Corp.,** has announced the appointment of **Paul C. Manley** as western sales manager and **R. E. Gerdetz** as eastern sales manager for the Mining Division.

P. C. Manley

R. E. Gerdetz

Manley will have headquarters in Chicago and will be in charge of all Western coal fields. Gerdetz will also maintain headquarters in Chicago and will be in charge of all Eastern coal fields.

Henry O. Erb, coal preparation consultant of Terre Haute, Ind., has been appointed manager of sales and engineering by the **Water Neutralizing Co.** of Columbia, Mo. The Water Neutralizing Co. has developed a patented process for neutralizing acid waters.

Dr. John V. N. Dorr, founder and chairman of the Board of **The Dorr Co.,** Engineers, has announced that, at a recent meeting of the Board of Directors, **J. Delano Hitch, Jr.,** presently executive vice-president, was elected president. He succeeds **E. R. Ramsey** who retired in accordance with company policy. Ramsey was elected vice-chairman of the Board, and will continue as a director of the company in addition to serving it as a consultant.

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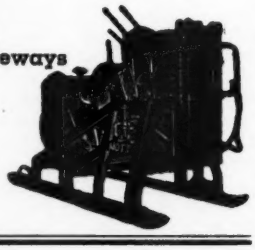

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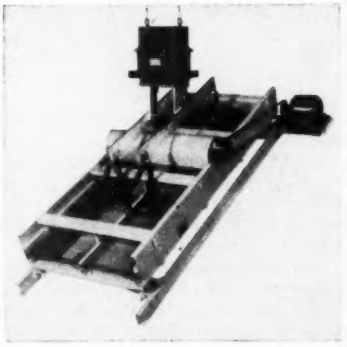

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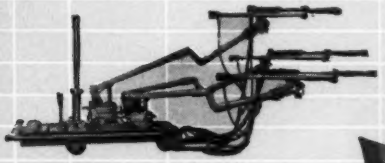


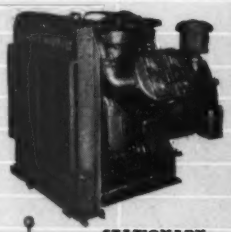
JUMBO—For a quick set up and get out.

STOPER—Balanced to boost production.

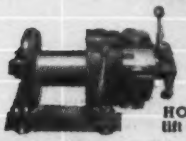
SINKER—Drives sinking costs to bed-rock.

LOADER—A quick pick-up for profits.

PORTABLE COMPRESSOR—Moves air right in—anywhere.



STATIONARY COMPRESSOR—Cuts air costs at the source.



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SUMP PUMP—Sucks nuisance water out of the way.

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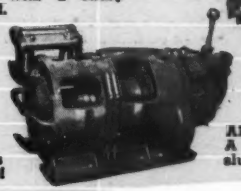

AIRSLUSHER—A steady tug cuts slushing costs.

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